PAINT and VARNISH Production.

THE TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT, VARNISH, LACQUER AND OTHER SYNTHETIC FINISHES

NEWPORT

TALL OIL ROSIN

Where PALE ROSIN IS USED

Here are the two newest, economical, very pale rosins of uniform quality. Try them in your formulations.

STAREX: W to X Color

•

LITE-X: Better than X in Color

Starex and Lite-X with exceptional, pale colors, have excellent heat stability and high rosin acidity.
Improve your products the low-cost, easy way. Write for samples today.

"ALWAYS WATCH NEWPORT FOR NEW DEVELOPMENTS"

NEWPORT INDUSTRIES Co.

A Division of Heyden Newport Chemical Corporation
342 Madison Avenue New York 17, N.Y.

JULY
1958

50c per copy

EAK . . . a high-boiling solvent with a future

In formulations for surface coatings, ethyl amyl ketone complements low-boiling MEK and medium-boiling MIBK by promoting better flow and gloss and eliminating dry overspray.

EAK possesses excellent blush resistance, good diluent tolerance and high solvency for surface coating materials. Its slow evaporation rate contributes to excellent flow-out, tends to minimize pinholing and bubbling in the film.

EAK has proved to be a valuable component of thinners for various types of coatings such as automotive refinishing lacquers, silk-screen printing lacquers and multicolor lacquers. Cellulose esters, vinyl polymers and copolymers, and almost all synthetic and natural resins are soluble in EAK.

Your Shell Chemical representative will be glad to discuss your specific solvent needs with you. Write for Organic Chemicals, a catalog of Shell solvents, resins and intermediates.

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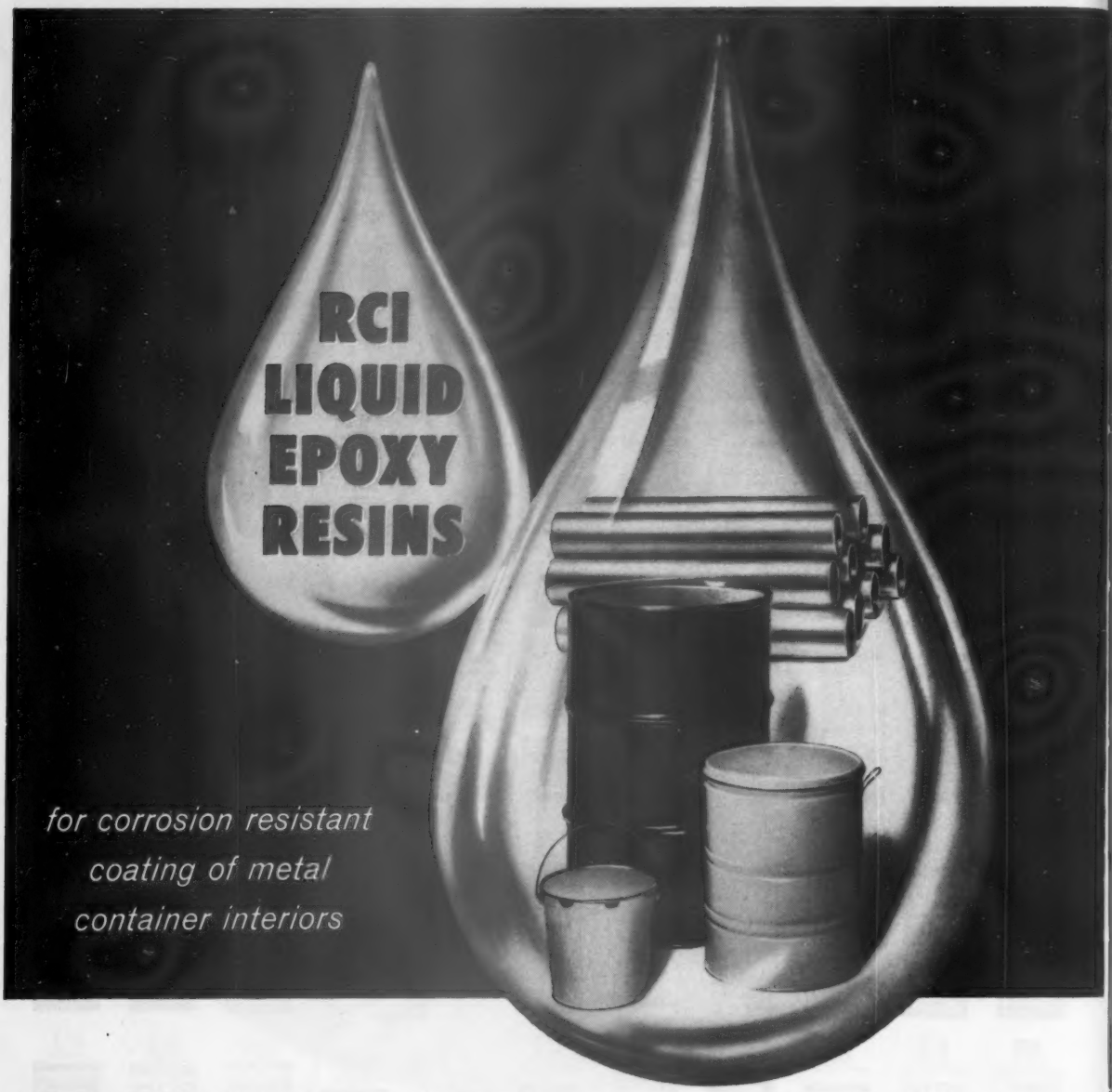
SHELL

YESSIR—ALL THESE FINE BRANDS ARE NOW SOLD IN **ACCU-POR** CANS!

And no wonder! Canco's Accu-Por can pours freely, yet won't drip a drop when righted. Handy, light, unbreakable, these containers are available in pint, quart and half-pint sizes—and priced as much as 25% below similar cans. Perfect for almost any liquid product—household specialties, automotive, marine. It is the ideal package for liquids—well suited to many dry products.

Maybe Accu-Por cans will help sell your brand! Talk to your Canco representative today.

CANCO **AMERICAN CAN COMPANY**



● RCI *liquid* epoxy resins — EPOTUF 6130 AND EPOTUF 6140 — when used with appropriate hardeners, or modified with other resins, produce superior protective coatings for the interiors of metal cans, pails, drums, tanks and pipelines. Both EPOTUF 6130 AND EPOTUF 6140 demonstrate high resistance to water, to many solvents, acids, alkalis and other chemicals. Formulations can be prepared which harden either in short time-cycles at room temperature or as baked finishes.

EPOXY RESINS IN SOLUTION are also available from RCI for convenient formulating. EPOTUF 6501, EPOTUF 6502 AND EPOTUF 6503 are resin solids dissolved in solvents. They are suited to a wide variety of applications in appliance and automotive finishes, in can and drum linings and in furniture finishes.

THE EPOXY ESTERS offered by RCI have been developed as vehicles for industrial and automotive primers and chemical resistant enamel coatings.

Can RCI's EPOTUF resins help you formulate superior corrosion resistant coatings? Write to RCI for Technical Bulletin SC-23 which contains specifications for these resins.

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Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol
Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride
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RCI BUILDING, WHITE PLAINS, N. Y.

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PAINT and VARNISH Production

(REG. U.S. PATENT OFFICE)

Formerly PAINT and VARNISH PRODUCTION MANAGER
(Established in 1910 as The Paint and Varnish Record)

VOL. 48 JULY, 1958 NO. 8

NEXT ISSUE

Our August issue will carry an interesting article describing a new device for measuring the sagging characteristics of paints and for rapidly assessing hiding power of paints.

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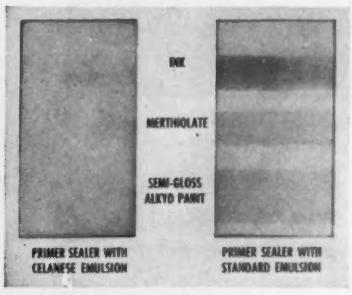
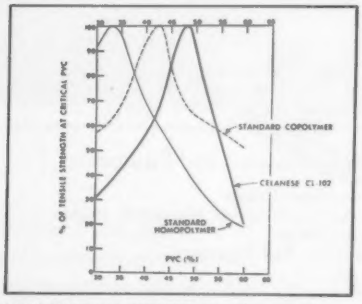
VINYL PAINT SALES

it's no accident

---------- that CL-102 Homopolymer and CL-202 Copolymer are helping manufacturers boost quality and sales!



LOW TEMPERATURE COALESCENCE. These primers were cast (4 mil wet film) at 34° F. on glass and allowed to cure overnight at this temperature. The paints were then stained and photographed from the reverse side of the glass. The primer made with Celanese PVAc exhibited superior film coalescence as evidenced by the sharp reduction in stain penetration.



HIGH PIGMENT BINDING. The above graph was prepared by plotting the tensile strength of paint films at progressively higher PVC's. A standard formulation was used and only the emulsions differed. In this comparison (both copolymers) the Celanese emulsion exhibited a critical PVC of 8% above the other copolymer.

FINE PARTICLE SIZE. The "inside story" of Celanese improved PVAc emulsions is clearly demonstrated in the above photomicrographs. Fine particle size indicates higher pigment binding, better non-settling, tighter, more closely knit films and better penetration of chalky or porous surfaces when applied at low viscosities.

SUPERIOR WATER RESISTANCE. Pictured above are three drawdowns of unpigmented PVAc films. (Both homopolymers plasticized with DBP.) The films were dried 72 hrs., then immersed in water for 5 min. The CL-102 film in the center maintains its crystal clear appearance and is substantially unaffected by the water.

DEPEND ON CELANESE PVAc EMULSIONS FOR: IMPROVED EXTERIOR AND INTERIOR PAINTS AND PRIMERS . . . SEMI-GLOSS AND GLOSS PAINTS . . . INDUSTRIAL METAL FINISHES.

And, to develop a new line of vinyl paints or to improve or expand your present lines, Celanese offers a comprehensive technical service. This includes up-to-date reference manuals, personal assistance, and cooperation of the Celanese Applications Laboratory.

Discover for yourself how Celanese emulsions and Celanese service can make the big difference in your production.

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Celanese®

CL-102 and CL-202 . . .

Celanese

homopolymer and copolymer

Scientists are Regular Guys

THE scientist is pretty much of a regular individual, who fits into our present society very nicely, according to a social science survey of DuPont research men.

The survey showed that the typical American scientists is a family man who takes deep interest in religious, social, and civic affairs. Perhaps because of their intellectual training, many scientists accept an even greater responsibility for civic and social obligations. Above all, they are proud and independent individuals.

About 1200 DuPont scientists were covered in this survey. It was undertaken after other sociological studies revealed widespread public misunderstanding, especially among high school students who have considered the scientist as a "square" or "anti-social hermit."

Interesting facts disclosed in the survey were:

The scientist is not an atheist, but a religious man. About 75 per cent of the DuPont scientists listed church as important in their activities.

Eighty-eight per cent of the DuPont scientists are married, and the average number of children per family is more than two.

He is active in civic affairs participating in community councils or associations, and in fund-raising groups. Many hold or have held positions of responsibility in these groups such as president, vice president, board of governors, etc.

The scientists like sports. Seventy per cent engage actively in 42 different sports. Golf is the most popular, with bowling second. Tennis is third and others range over fishing, hunting, swimming, sailing, softball, etc.

Many have some sort of a hobby which include gardening, bridge, dancing, painting, bird watching, archeological field work, music, chess, cooking, etc.

"Goof-off" Era

SPEAKING to the recent National Sales Executive Convention in Washington, Charles Brower, president of Batten, Barton, Durstine & Osborn said that this country is going through "the great era of the goof-off, the age of the half-done job."

He said—

"The land from coast to coast has been enjoying a stampede away from responsibility.

" It is populated with laundry men who won't iron shirts, with waiters who won't serve, with carpenters who will come around some day maybe, with executives whose minds are on the golf course, with teachers who demand a single salary schedule so that achievement cannot be rewarded . . . with students who take cinch courses. . . "

In commenting on salesmanship, Mr. Brower said that the mediocrity of salesmanship is only part of our national pattern of always willing to settle for something less than the best.

"There is no such thing as 'soft sell' and 'hard sell', he said. There is only 'smart sell' and 'stupid sell'. "

Perhaps we all cannot agree with Mr. Brower's comments, but. . .

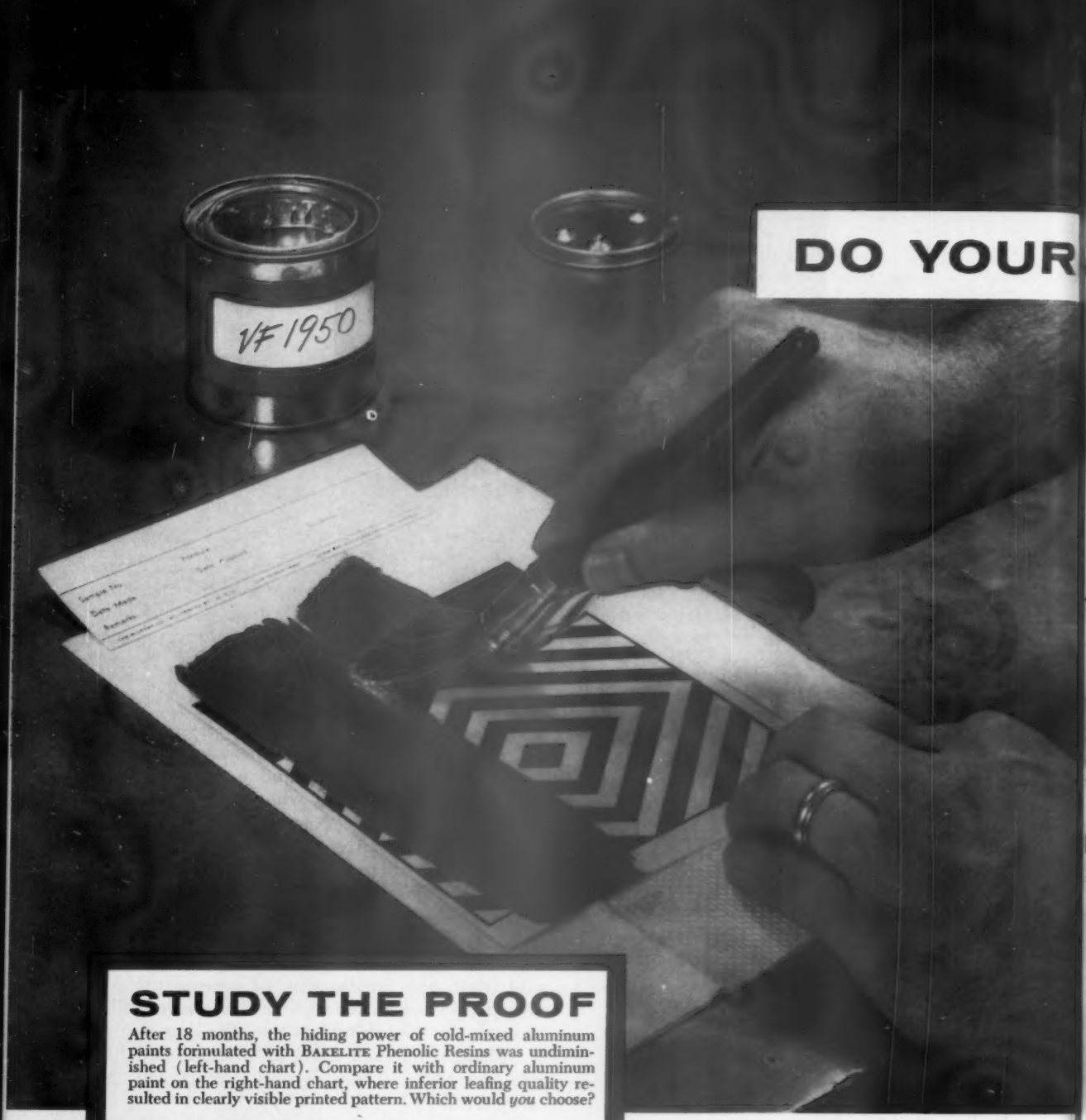
Aerosols Spurt Ahead

AEROSOL products keep spurting ahead according to a survey made by the Chemical Specialties Manufacturers Association. The survey revealed that the total nonfood aerosols hit 390 million units in 1957 compared to 320 million in 1956.

Pigmented and metallic paints and clear sprays showed spectacular growth reaching 36.5 million units in 1957 from a total of 22.5 million units in 1956, an increase of 62%.

At this rate the paint industry can look for a 50-million volume of aerosol paints for 1958.

This trend is a clear indication that aerosol paints are gaining in popularity both in industry and around the home.



DO YOUR

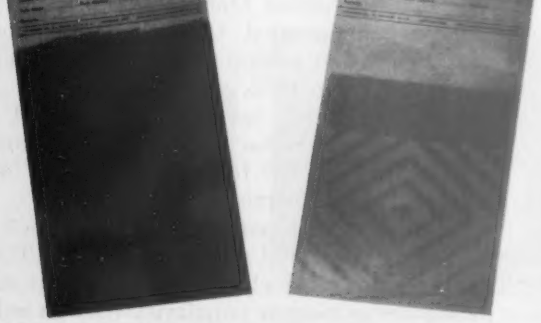
STUDY THE PROOF

After 18 months, the hiding power of cold-mixed aluminum paints formulated with BAKELITE Phenolic Resins was undiminished (left-hand chart). Compare it with ordinary aluminum paint on the right-hand chart, where inferior leafing quality resulted in clearly visible printed pattern. Which would *you* choose?

SUCCESS vs. FAILURE

with Bakelite Brand Phenolics

with conventional-base coatings



How this test was made:

Morest charts were coated by giving them a single stroke application of an alkyd-based ready-mixed aluminum paint, and one based on BAKELITE Phenolic Resin. The charts were photographed after 24 hours. Both paints had been stored in sealed cans for 18 months.

CUSTOMERS ASK FOR:

Retention of leafing?

PLUS...the outstanding performance of *phenolic* resin based coatings and the *ease* of *cold mix* formulation.

TRY A TYPICAL FORMULATION

EF-2315 Ready-Mixed Aluminum Paint

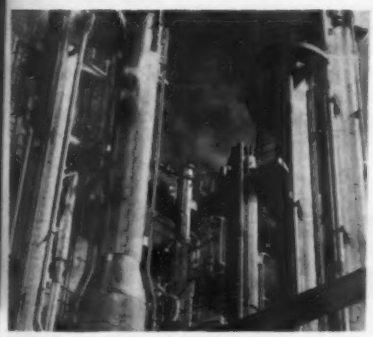
VEHICLE: VF-1950, a 25 gallon, CKR-2400, 75% tung oil, 25% alkali refined linseed oil "cold blend" varnish

FORMULA:	POUNDS	GALLONS	PERCENTAGE BY WEIGHT
Aluminum Paste (65.5% N.V.)	200.8	16.26	24.44
VF-1950 (55.6% N.V.)	618.8	83.49	75.33
6% Cobalt Drier	1.9	0.25	0.23
THEORETICAL YIELD	821.5	100.00	100.00

LOW COST WILL SURPRISE YOU

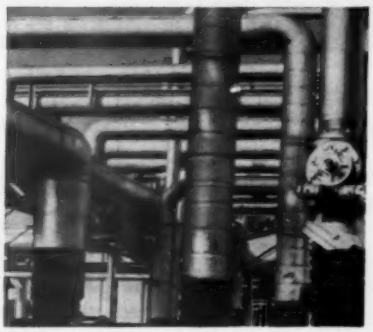
This is another application of the economical "cold mix" technique developed by Bakelite Company. Ready-mixed aluminum paints based on BAKELITE Brand Phenolic Resins combine low-cost production...superior retention of leafing, even after 18 months storage. They also have improved hiding power, superior reflection, long shelf life, and excellent resistance to outdoor weathering. Talk to your Bakelite Company representative or mail the coupon below.

EXCELLENT PROPERTIES EXPAND MARKETS



Reflection life gives these paints a big market in oil refineries. They stay bright throughout long periods of exposure to sun, weather, and corrosive atmospheres.

Years of service in protecting the San Francisco Bay Bridge against chemicals, weather, corrosion, and physical wear highlight the economy of these coatings.



Clean protection for pipe lines is provided by a coating that stays bright and resistant to corrosive atmospheres, weather, chemicals, and sun.

It pays to formulate with

BAKELITE
BRAND
RESINS FOR COATINGS
...phenolics, vinyls, epoxies

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BAKELITE COMPANY
Division of Union Carbide Corporation
30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Toronto 7

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Bakelite Company, Dept. IL-04L
Division of Union Carbide Corporation
30 East 42nd Street, New York 17, N. Y.

☐ Please send latest formulation data only.

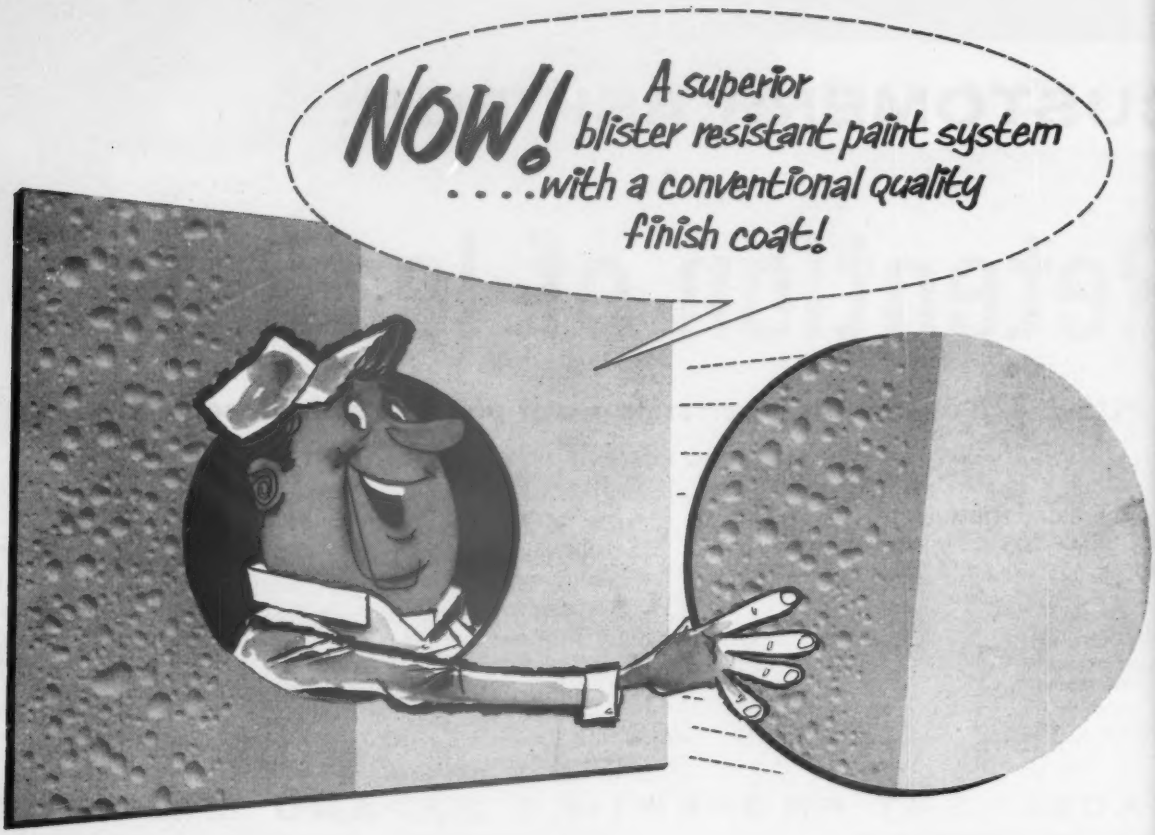
☐ Please send formulation data and sample of BAKELITE Phenolic Resin for ready-mixed aluminum paints.

Name_____ **Title**_____

Company_____

Address_____

City_____ **Zone**____ **State**_____



TEST PANEL on right shows that no blistering occurred in the paint system using a primer formulated with Eagle-Picher Super Sublimed White Lead—top coated with Federal Specification TT-P-103.

Yours...with EAGLE-PICHER Super Sublimed White Lead!

Accelerated tests prove that blistering *does not occur* when quality house paint primers are formulated with Eagle-Picher Super Sublimed White Lead. Even under adverse moisture conditions, these primers show very little water absorption, low volumetric swelling and superior adhesive characteristics.

Equally important—Eagle-Picher Sublimed White Lead makes your primer an *all-purpose primer* . . . compatible with *any* quality top coat house paint.

Since 1843

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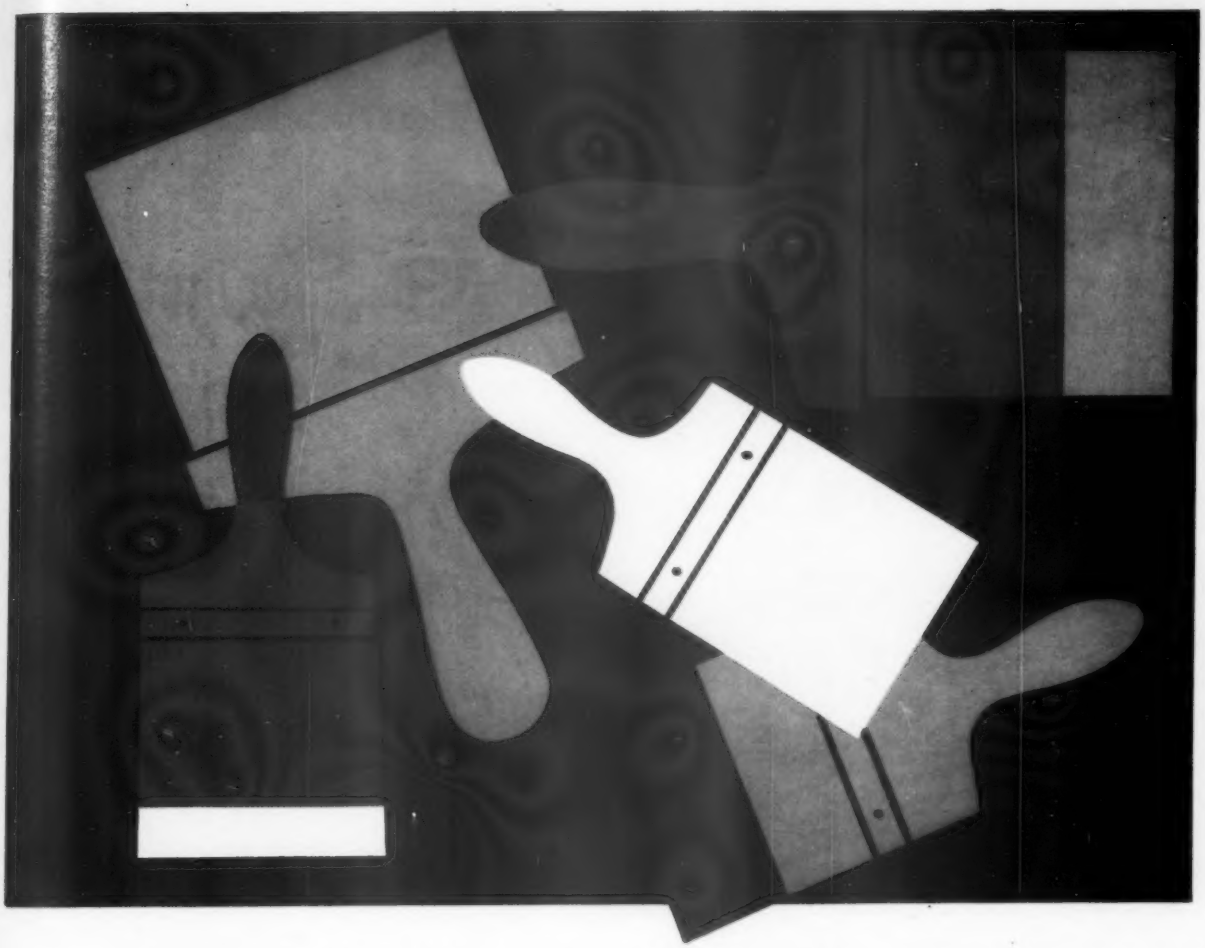

here's why Gelva PVAc emulsions offer more for your money

you can sell the application values of Gelva based paints

Outstanding brushability and leveling are characteristic of paints based on GELVA TS-30. They are two important application advantages which you can sell to your customers. Free filming GELVA TS-30 also has superior stability, optimum distribution of particle size, and an unexcelled balance of properties for a full line of coatings, interior and exterior paints and primer-sealers.

Success with PVAc paints requires a quality emulsion and expert technical service. You get both from Shawinigan.

What's more, Shawinigan provides GELVA users with technical service in depth . . . technical service based on more than 10 years experience with commercially proved polyvinyl acetate paints. Shawinigan is ready to give you all the assistance you need to formulate and manufacture exactly the right polyvinyl acetate paint, homopolymer or copolymer, for your market. It will pay you to consult Shawinigan . . . we have the quality and the know-how. Write for our booklet, "GELVA Emulsions for Paint", to Shawinigan Resins Corporation, Department 2207, Springfield 1, Mass.

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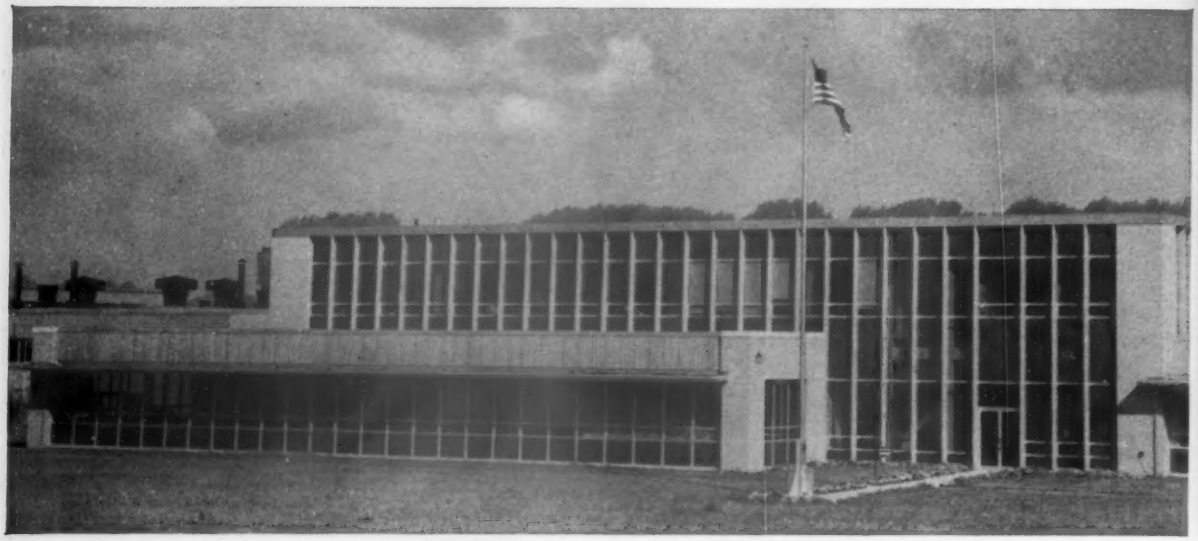
GELVA® *emulsions for paints*

SHAWINIGAN RESINS

Outdoor aluminum needs the protection of Half-Second Butyrate lacquers—

ALUMINUM BUILDINGS, for instance!



Clear, non-yellowing, weather-resistant coating preserves exterior of American Sterilizer Building

Light, durable aluminum is fast becoming one of the most widely used metals for outdoor use. But, although aluminum withstands weathering without suffering structural damage, its surface does deteriorate.

Not only does it lose its luster and develop a grayish-white oxide film, but, under the severe conditions found in most cities and industrial areas, it also corrodes and pits—and these pits collect and hold dirt and grime.

The American Sterilizer Company, the world's largest manufacturer of sterilizers and related hospital equipment, has solved just such a problem on its plant and office building in Erie, Pennsylvania.

Following carefully prescribed cleaning, restoring and pretreating procedures, the finish of the exterior aluminum walls of the building has been protected against a recurrence of this deterioration with a weather-resistant Half-Second Butyrate lacquer.

This clear, tough, non-yellowing lacquer will protect the gleaming finish of the restored aluminum surface for years, requiring only occasional hosing of areas of extreme contamination. The action of the rain alone will remove the accumulation of most dirt or grime.

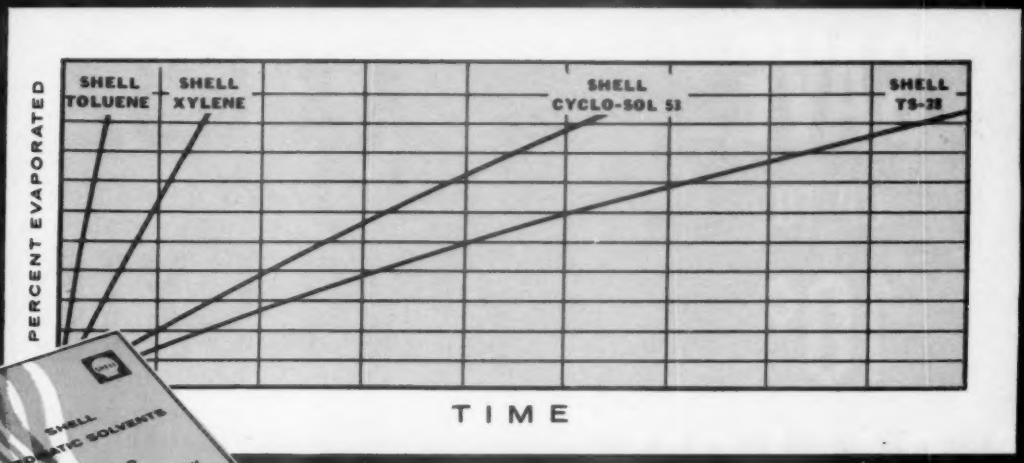
You can take advantage of the growing market being created by the expanded use of aluminum as an exterior material by offering Half-Second Butyrate lacquers.

HALF SECOND BUTYRATE
an Eastman film former

A new 15-minute, 16mm. sound color film entitled "Half-Second Butyrate—a protective coating for exterior aluminum surfaces" is available without charge, for viewing by those interested in this market. Write to Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Co., 260 Madison Ave., New York 16, N. Y.

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; New York City; Framingham, Mass.; Cincinnati; Cleveland; Chicago; St. Louis; Houston. West Coast: Wilson Meyer Co., San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

For industrial finish formulation...



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with a variety of evaporation rates

Typical properties are given in the booklet shown. Write for a copy.

SHELL TOLUENE

. . . for applications where very fast evaporation and high solvency are required.

SHELL XYLENE

. . . has an exceptionally narrow distillation range, is slower drying than toluene.

SHELL CYCLO-SOL* 53

. . . an excellent solvent with higher flash point and slower evaporation rate than xylene. Recommended for baking finishes and flow coating.

*Registered Trademark

SHELL TS-28 SOLVENT

. . . a still slower drying aromatic concentrate of medium high solvency. Recommended for baking finishes and flow coating.

These Shell solvents cover a very wide range of evaporation rates. Their individual characteristics satisfy specific requirements in a great variety of formulations.

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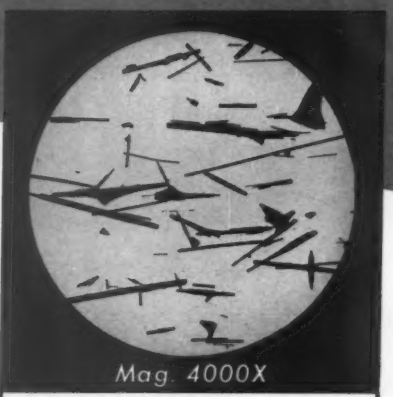
SAVE UP TO 10¢ A GALLON with

XX-602
(LEAD FREE)
ZINC OXIDE

HIGHEST CONSISTENCY
FULLY ACICULAR

No Colloidal Fines


Mag. 4000X

HORSE HEAD® XX-602 is a major development to help you cut the cost of exterior house paints.

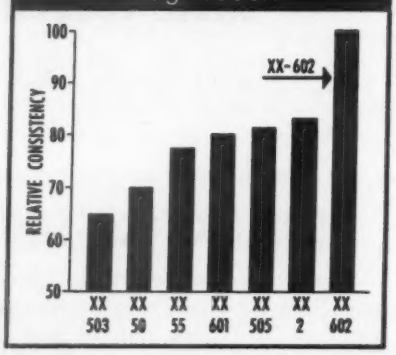
MORE BODY

You need only take advantage of its extra high consistency. Its long, fine needles give house paints as much as 10 K.U. more body than conventional zinc oxides. And XX-602 holds its body in the can exceptionally well because it is free of reactive fines.

REDUCE YOUR PIGMENT CONTENT

Cut back that extra body, if you wish, with additional combined vehicle or thinner . . . and count your savings.

Send for a sample of XX-602 now.



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HORSE HEAD PRODUCTS ®

How about these "cold weather" paints?

I hear they're based on Lytron 680 Latex*

Lytron* 680

can produce smooth clear films, without modification, down as low as 40°F!

Low temperature coalescence that stretches the painting season pleases painters everywhere. That's one reason why they like the new paints based on Monsanto Lytron 680.

Other "thankful" features include excellent adhesion, even over glossy surfaces, which results from the controlled small particle size of this chemically unique acrylic-type interpolymer. This also assures proper binding of high volumes of pigment, superior color retention, greater stability. Painters also admire the ease of application over porous or sealed surfaces. No spotting or color mottling, no ruptures, minimum blistering even over green masonry. Water resistance within 30 minutes. Fast drying rate, easy clean-up.

SPECIAL NOTE TO MANUFACTURERS OF INTERIOR PAINTS: Although Lytron 680 was developed as a binder for exterior paints, features have been incorporated which make it equally useful as a sole vehicle or as a modifier of other alkaline latex vehicles in high quality interior paints. Small quantities of Lytron 680 added to alkyd or styrene butadiene systems can improve dryability, adhesion, durability, flexibility. Be sure to investigate this low-cost way to gain the superior properties of Lytron 680. For further information on Lytron 680, write Monsanto Chemical Company, Surface Coating Resins Dept., Springfield 2, Mass.

Other Monsanto products for the surface coating industry include Amino Resins, Phenolic Resins, and Styrene Latices and Resins.

Monsanto

*LYTRON: REG. U. S. PAT. OFF.

FILTERED... SPARKLING CLEAR

Araldite® Epoxy Resin Solutions

bring new convenience versatility and dependability

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Pounds per gallon 25°C (77°F)	9.0	9.4	9.3	8.9	8.7	9.5
Viscosity (Gardner-Holdt)	Z_1	Z_6	Z_3	T	Z_2	Z_4
Solids Content	75%	80%	75%	70%	55%	90%
Resin ARALDITE	6071	6071	6071	6071	6097	6040
Solvent	35% Xylol 65% Methyl Isobutyl Ketone	75% Cellosolve 25% Xylol	100% Toluol	100% Methyl Isobutyl Ketone	50% Toluol 50% Cellosolve Acetate	100% Xylol

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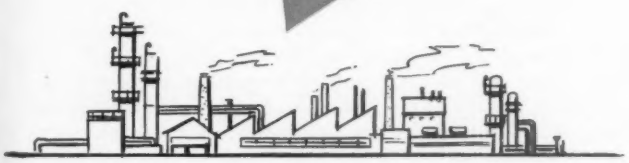

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pH	3-5	3-5
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THIXOTROPIC PROPERTIES OF PAINTS

A simplified method for determining thixotropy using the Brookfield viscosimeter is proposed

Dr. J. Rinse

By
Dr. J. Rinse*

It is proposed to use a Brookfield Viscosimeter at 6, 60 and 6 rpm at fixed intervals. The method requires only two minutes for each sample, cleaning time included. The data enables one to determine storage-stability, in particular of gel paints. The method has also been used for a comparison of thixotropic additives and the results indicate that most of them primarily create false body. Only chemically reactive thixotropic agents, like polyamides and certain aluminum acrylates which react with the active groups of alkyd molecules enable the preparation of vehicles with true thixotropic properties. A certain correlation of the measurements with brushability, leveling and sagging properties seems to be apparent, but requires further investigation. Thixotropy of latex paints can also be measured with the proposed method.

THE consistency or viscosity of paints is determined by several methods (Gardner, Hoepler, Krebs, etc.) and is usually expressed in poises or other units. One value is obtained for each paint.

In recent years the thixotropic properties of paints have become more and more emphasized, and there is a definite need for a more complete determination of the rheologic properties of paints. With thixotropic paints, the viscosity diminishes with agitation (with brushing or spraying) and increases again upon standing. After application, when all the solvents evaporate, this viscosity increase is particularly high.

The changes in paint viscosity may be determined with rotation viscosimeters, adjustable at a number of speeds, e.g. 6-60 rotations per minute. Several types of rotation viscosimeters are available, e.g. Brabender, Brookfield, Ferranti, etc. They enable the determination of two viscosity curves, one at increasing speeds and another at decreasing speeds as indicated in Figure 1.

The degree of thixotropy is characterized: a) by the difference between the viscosities at lowest and highest speeds going from low to high speed; b) the same differences but going back from high to low speed; c) the recovery value after a certain standing interval (e.g. one minute or one hour or longer).

The determination of a complete curve requires rather considerable care and takes more time than a simple consistency determination. For this reason most paint laboratories do not determine thixotropy curves as part of their routine testing. Because the duration of agitation and the standing interval greatly influence the viscosity values, measurements must be completely standardized. Otherwise

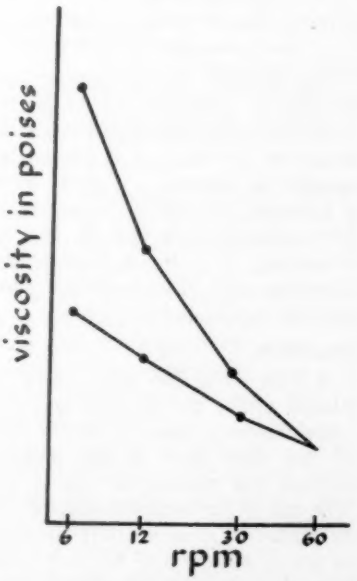


Figure 1. Two viscosity curves, one at increasing speeds and the other at decreasing speeds.

*Chemical Research Associates, Inc., Bernardsville, N. J.

no comparison of data is possible. Another objection against general acceptance of many rotation viscosimeters is the arduous cleaning job involved with each series of determinations.

During an investigation of thixotropy of paints, a method has been developed which eliminates the above-mentioned objections. It is a highly standardized, simplified method which enables a skilled operator to measure one sample, plus cleaning the apparatus within two minutes. Accordingly, it is very possible to examine 30 paint samples per hour and determine the thixotropic characteristics a and b as defined above. When temperature deviations are not large, the determinations do not necessarily require a thermostat. For most practical work this may be done at room temperature (20°C ± 2°C).

Test Set-Up

A comparison of various rotation viscosimeters indicates that the Brookfield viscosimeter with 6, 12, 30 and 60 rpm is very suitable in thixotropic determinations because:

(a) it is reliable and accurate;
(b) it can be cleaned easily
(c) its values can be converted into poises;
(d) small samples of paint (50 cc) are adequate for a test run; and
(e) it has a wide acceptance in most paint laboratories.

The bracket for protecting the spindle is removed (Fig. 2) in order to avoid any disturbance of structure of the paint when the spindle is lowered. Paints with a viscosity of 2-1000 poises may be measured with Spindle No. 4, consisting of a thin rod of 3 mm diameter and 32 mm length (immersed part). See Figure 3.

Procedure

A can or a jar with paint is placed under the spindle and the viscosimeter is lowered slowly, until the thin part of the spindle reaches the surface of the paint. The can or jar is moved horizontally about 10 mm. so that the test is run in a section of the paint not disturbed by the lowering of the spindle. See Figure 3. Then the viscosimeter is started at 6 rpm.

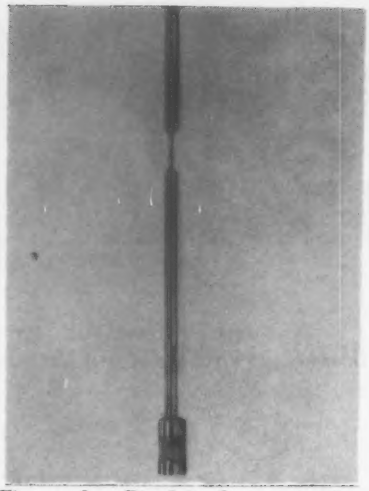


Figure 2. Bracket for protecting spindle.

The needle is watched and when it moves at equal speed with the rotating scale (after 1 or 2 rotations), the position is read on the inner circle of the scale. This value is doubled to obtain the value in poises. The speed is then increased to 60 rpm and after 30 seconds, the apparatus is stopped and the position of the needle relative to the scale is read again. This value is divided by 5, giving the poise value at 60 rpm. Immediately after the reading the speed is returned to 6 rpm. A very skilled operator does not need to stop the viscosimeter for a reading at 60 rpm. Because the needle (after the return to 6 rpm) proceeds slowly to a lower value on the scale, it takes 2 or 3 full rotations until no further decrease is noticeable. This minimum value is read and multiplied by 2 to find the poise value. By this method a thixotropic paint is characterized by three figures, e.g. 80-25-65 poises indicating the speeds at 6-60-6 rpm respectively.

After the third reading the apparatus is stopped with zero visible at left side of opening. The viscosimeter is raised and the spindle cleaned with a piece of absorbing paper or with a cloth. It is then ready for another test. Sometimes it is necessary to remove the thick layer of paint from the spindle by means of a spatula.

When raising the spindle out of the paint, its behavior should be watched. Non-thixotropic paints will drip; gelled and "false-body" paints do not drip thus leaving

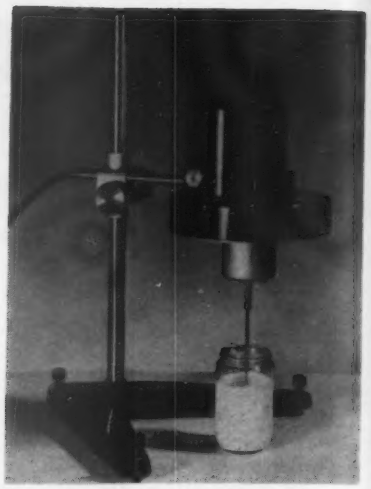


Figure 3. Test set-up using Brookfield viscosimeter.

a minimum of paint on the spindle. High consistency paints and pastes some times build up to a thick layer around the spindle, which flows down slowly. These paints are difficult to brush.

Consistency Data Vs. Brushability

A non- or slightly- thixotropic paint is brushable at 2-15 poises. This property has been known by paint chemists for a considerable length of time. No data is yet available for thixotropic paints, because the shearing force by the brush is much larger than the shearing force by the spindle.

However, some preliminary conclusions can be drawn from a large number of experiments recently performed by the author.

If the difference between the 1st and 2nd viscosity number is large, e.g. in the ratio 10:1 the viscosity at 60 rpm may be 50 poises and the paint will still be quite brushable. Highly gelled paints with initial (6 rpm) viscosity of over 1000 poises and 100 poises at 60 rpm may be easily brushable. A high value of the 3rd viscosity number indicates fales body and indicates poor leveling of the coating. Eventually a fourth reading may be taken after 60 seconds or 60 minutes of standing to determine the speed recovery in viscosity. The accuracy of the determination at 60 rpm and of the second 6 rpm viscosity is 2-3 poises, but the variations of the first 6 rpm viscosity are usually larger (5-15%).

This method has been developed to determine the stability of gelled

paints during storage and has proved to be very helpful for this application. Also it has been tried on a more limited scale for the evaluation of thixotropic additives. The method is applicable to alkyd, oil- and latex paints. Some of the results are given later in this paper.

Thixotropic Paints

Thixotropy depends on various influences. Pigmentation is very important; highly pigmented paints usually are thixotropic even when the vehicles (e.g. bodied oils) follow Newton's law. Accordingly for studying the behavior of thixotropic additives and gelled alkyds, it is necessary to reduce the influence of pigments as much as possible. Therefore, rutile titanium dioxide, was chosen and a low pigment volume concentration (20%) was taken. The vehicle is a long oil soya alkyd.

Thixotropic properties in this type of gloss paint are more difficult to create and to maintain than in higher pigmented paints or those containing active pigments like zinc oxide or white lead or certain silicates.

Effect of Additives

Seven samples of commercial thixotropic additives or puffing agents were used at 0.5% and 2% concentration calculated on the finished paint. The additives were added before the grinding and the paints were stored for 7 hours at 50°C and then reground if necessary. Finally they were stored for one month at room temperature.

The results of the measurements with the Brookfield viscosimeter are given in Table I.

The determinations indicate that the ratio of the viscosities at 6 rpm is between 1.5 and 1.0, which means a rather rapid recovery or so-called false body.

Brushability and leveling tests proved indeed that leveling was badly influenced by most additives and that those with good leveling did not have much thixotropic behavior.

Gloss was strongly reduced at the 2% level and moderately at 0.5% concentration. Sagging was prevented only when the ratio of viscosities at 60 and 6 rpm (3) was smaller than 3-4.

		(1) Viscosities in Poises at 20	(2) ½ 2 C.	(3)
		6 rpm	60 rpm	6 rpm
Thixotropic Agent	A 2%	34	23	28
	B 2%	30	23	30
	C 2%	300	47	220
	D 2%	250	38	200
	E 2%	44	31	34
	F 2%	360	47	240
	G 2%	200	52	172
	C 0.5%	40	34	40
	D 0.5%	62	56	60
	F 0.5%	34	28	30
	G 0.5%	150	27	138
Blank (no additives)		24	23	24

Table I. Results of measurements with Brookfield viscosimeter at various rotational speeds.

	(1)	(2) Viscosities in Posies	(3)	(4)
	6 rpm	60 rpm	6 rpm	6 rpm 1 minute later
Polyamide gelled alkyd paint	400	67	160	300
Aluminum acrylate gelled alkyd paint	700	86	250	380

Table II. Results of two types of gelled alkyd paints at various rotational speeds.

	(1)	(2) Viscosities in Poises	(3)
	6 rpm	60 rpm	6 rpm
Latex Paint A (exp.)	280	40	60
" " B (exp.)	160	29	88
" " C (comm.)	28	6	26
" " D (comm.)	120	36	110

Table III. Results of experimental and commercial latex paints at various rotational speeds.

Alkyd Gel Paints

Two types of gelled alkyds were used, both at 20% pvc with titanium dioxide. (see Table II).

Both paints are highly thixotropic; are easily brushable and level well. Also gloss is high, especially of the second paint. The good leveling corresponds with the high ratios of viscosities (1) and (3) which are 2.5 and 2.8. Prolonged storage tests have shown that both types of gelled paints are completely stable.

Thixotropy of Latex Paints

Several experimental and commercial latex paints were tested and gave the following results. (see Table III).

As show in Table III, a correlation was noticeable between viscosity values, brushability and leveling.

Stability of Thixotropy

It has been observed that storage builds up viscosity, as may be expected. Sometimes several weeks were needed to reach a maximum, particularly if the paint is freshly made. Reagitated or reground paints usually become stable in 1 or 2 days.

Driers and anti-skinning agents influence thixotropic values; in most cases they lower viscosity.

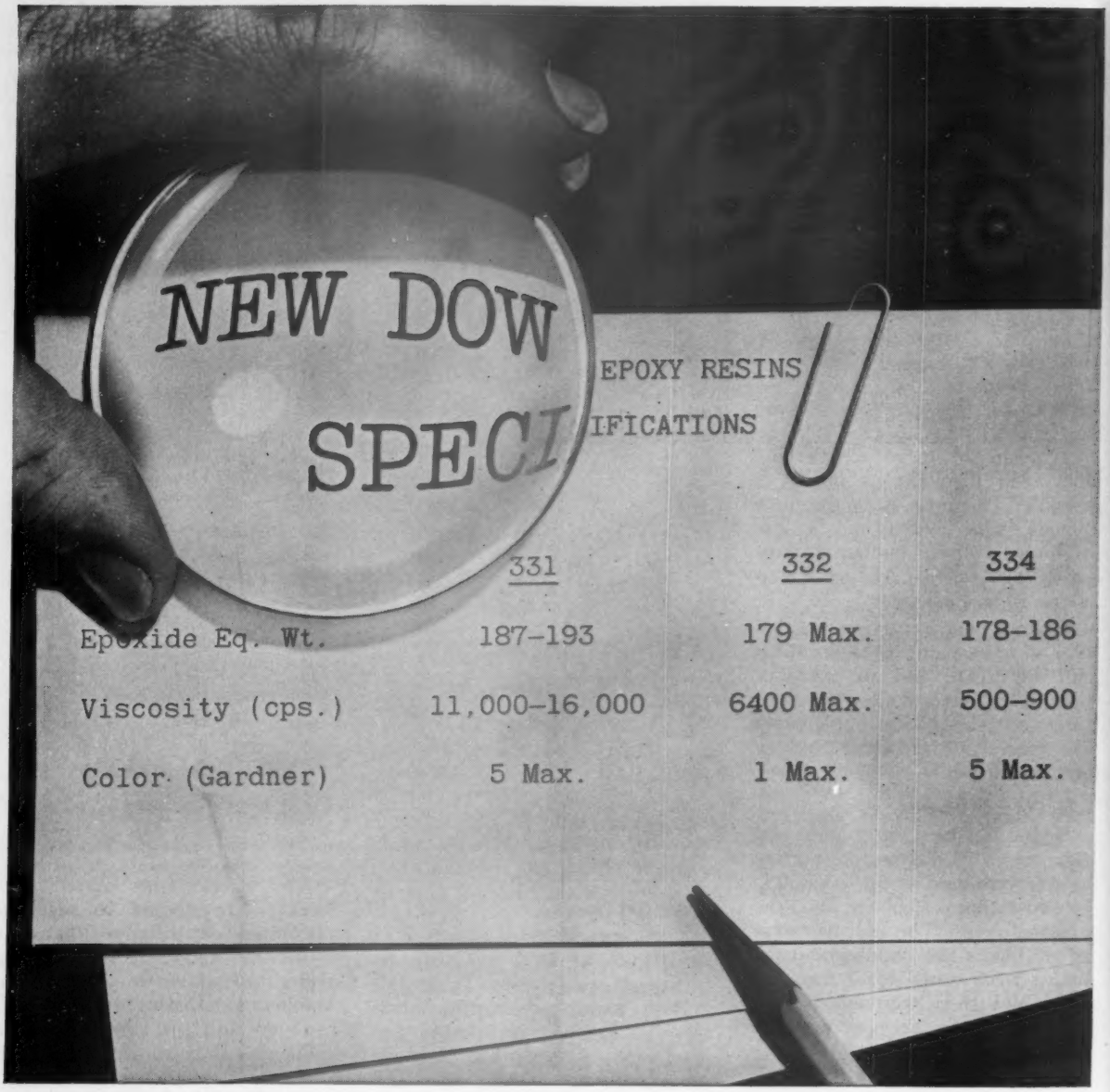
Conclusions

1. A method is proposed for determining thixotropic behavior of paints and expressing this in three or four values.

2. Thixotropic additives generally contribute little to desirable thixotropic properties. They primarily cause false body and only some of them do not recover rapidly.

3. Chemical combinations of alkyds and thixotropic agents cause desirable thixotropic behavior with longer recovery times enabling good leveling.

4. Latex paint-thixotropy has been determined and the results correspond also with brushability tests.



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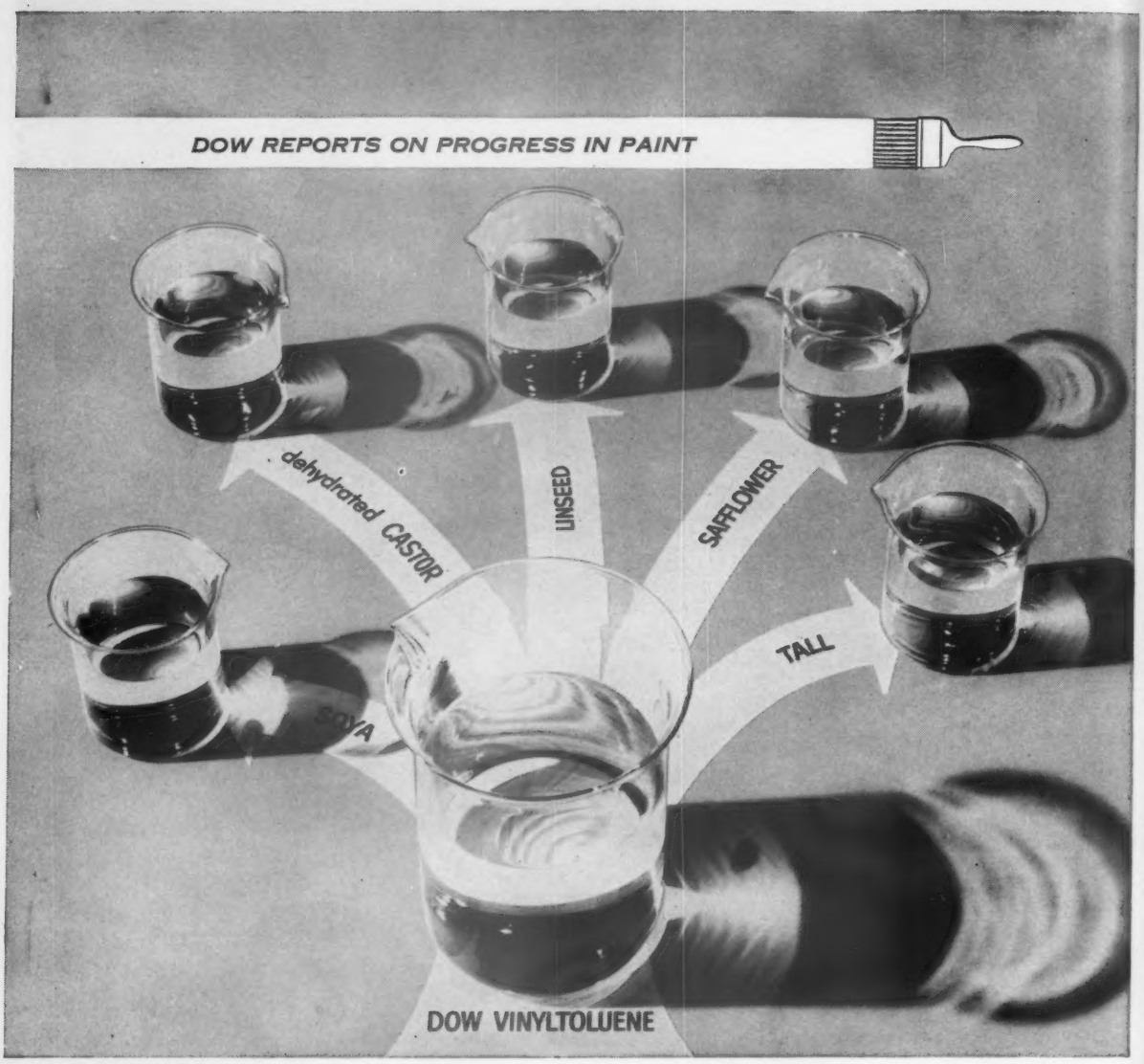

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A Staff Report

PETROCHEMICALS for PAINT

PART VI

Petrochemistry and the Paint Chemist

(continued)

SOLVENTS

The importance of solvents to the protective coatings industry is indicated by the fact that in 1956 this industry spent approximately 100 million dollars on solvents and plasticizers. The bulk of these have petrochemical origins, and accordingly merit discussion in this portion of the article.

It goes without saying that the bulk of the protective coatings produced today are dependent on solvents to facilitate their application. Water-dispersed coatings have, of course, become of great importance in the past few years and will become of even greater importance as industrial and maintenance paints containing water are devised. Also, the paint industry is intrigued with the idea of completely solventless varnishes and protective coatings formulated with vehicles which are sufficiently fluid to preclude the need for solvents. Even so, one can expect that solvents will be with us for many years to come and that the changes, like most new advances, will simply serve to expand the over-all utility of protective coatings, thus making the markets larger.

The alkyd industry relies heavily on hydrocarbon solvents, utilizing both aromatic and aliphatic materials. The latter are used for the long oil alkyds, whereas the former are used for the short oil and for some of the medium oil length alkyds. When the alkyd resins are combined with other vehicles such as vinyls, urea or melamine resins, or silicones, stronger solvents, such as the ketones, esters, ethers, and ether alcohols may be required.

One of the most important solvent problems which the protective coatings industry has faced has been to find proper solvents for nitrocellulose lacquers and for related cellulose derivatives. These tend to dissolve only in strong solvents and to give solutions of low solids concentrations. Lacquers, based on nitrocellulose, originally contained eight to ten per cent of nitrocellulose, together with sufficient pigment, oil, gum, and plasticizer to raise the solids concentration to 20 to 25 per cent. The remainder of the composition was volatile thinner. Of the solvent portion of the composition, approximately two-thirds was toluene and one-third was a strong solvent or combination of solvents, such as ethyl acetate, butyl acetate, amyl acetate, ethyl alcohol, or butyl alcohol.

Through the years, solvent combinations have been devised which have made it possible to increase the solids content of lacquers. One way that this may be done, of course, is simply to increase the concentration of the strong solvent and, particularly, to use more alcohol or alcohol-containing solvents such as the Cellosolves and the Carbitols. For certain finishes where high solids are absolutely necessary, it is feasible to use only the high solvency thinners and to eliminate entirely the diluting hydrocarbons. For such high solvency thinners, methyl ethyl ketone is important.

Very much the same problem is encountered with the vinyl vehicles, which again tend to dissolve only in strong solvents and to provide compositions of low solids content. Actually, the situation is even more difficult because the vinyl resins tend to have a lower degree of solubility than the cellulose derivatives.

Thus, ketones which are stronger solvents than esters or alcohols are the preferred solvents for vinyls. Also, vinyl resins do not tolerate alcohol as well, which means that ketones cannot be coupled with the alcohols to obtain the stronger solvency that has been helpful in the nitrocellulose lacquer industry.

The solvents available from the petrochemicals industry are so numerous that detailed discussions cannot be included here. Rather, an attempt will be made to point out what solvents the petrochemicals industry makes available to the surface coatings industry, and what the general fields of applications of these solvents are.

Hydrocarbons

There are, of course, numerous grades of petroleum solvents available. In general, they are obtained by fractional distillation and one of their most important specifications is boiling range which is an indication of volatility. Compatibility is, of course, a major factor; and more recently odor has become important. Waters has discussed hydrocarbon solvents in detail in a series of articles in *Paint Industry Magazine*, starting in January 1955.

In the lower boiling categories are the so-called petroleum ethers. These are the most volatile fractions and are generally quite pure. The common petroleum ether boils between 40-60°C. and is largely hexane. Other petroleum ethers are available which boil between 60-70°C. and 60-80°C.

The cuts beyond the petroleum ethers are the gasoline cuts. These also may be known as petroleum ethers or as benzines or motor spirits. The boiling range is 60-120°C. The next higher materials, which have a boiling range of 80-130°C., are known as petroleum spirits. These may also be known as ligroin, benzine, petroleum ether and petroleum naphtha. Thus, it may be seen that there is a good deal of overlapping so far as nomenclature is concerned.

A cut boiling between 100-160°C. is known as Varnish Makers' and Painters' Naphtha (VM and P naphtha). Its solvency is intermediate between that of gasoline and mineral spirits, which will be discussed next. Coal tar solvents and turpentine are often added to VM and P naphtha in order to improve its solvency. In paints and varnishes, VM and P naphtha is used most frequently for dipping and spraying formulations because it imparts depth and gloss to the films. It is also used for certain varnishes based on natural resins, gloss furniture varnish, metalware enamel, penetrating stains and furniture polish.

Mineral spirits is also known as petroleum distillate, oleum, heavy naphtha and turpentine substitutes. The boiling range specifications normally require that 90 per cent of the material boil below 200°C. Mineral spirits is used widely in the paint industry because it has a high flash point of 86-105°F. Thus, when mineral spirits became available, turpentine usage declined. Mineral spirits is used for brushing paints since it contributes easy working qualities and good flow. At the same time, it does not retard drying. The solvent is said to improve the dispersion of pigments in mill whites, flat whites, undercoats, and primers. It is also used with varnishes based on natural resins. Although mineral spirits will dissolve linoleate driers, incompatibility develops on storage. Accordingly, it is necessary to add higher fatty acids, rosin, or oil in order to effect compatibility.

Kerosene is a hydrocarbon fraction boiling between 150-250°C. This material evaporates slowly an thus imparts good flow, penetration, easy brushing and good working qualities to paints and varnishes. Also, it prevents surface skinning. It is used in slow-drying paints, dipping primers, enamels, baking Japans, alkyd resins, varnishes, asphalt coatings, and as a thinner in Dammar enamels.

The hydrogenation of petroleum solvent naphthas provides hydrocarbon solvents with good solvent power for synthetic resins. These hydrogenated solvents are available in several grades boiling from 93°C.-238°C.

The aromatic hydrocarbon solvents available from petrochemical sources start with benzene. Benzene may be used as a diluent for lacquers but its use is restricted because of its toxic nature. Toluene or methylbenzene, on the other hand, is widely used as a hydrocarbon diluent in lacquers because of its lower vapor pressure and its higher solvency. Also, toluene is not as toxic as benzene.

The xylenes or dimethylbenzenes are solvents for cellulose esters. When combined with anhydrous alcohol, they dissolve some forms of cellulose nitrate. The xylenes are solvents for ethyl and benzylcellulose, ester gum, polystyrene, methyl methacrylate, urea-formaldehyde resins and a variety of oils. The boiling point of xylene is in the range of 140°C.

The aromatic solvents are widely used for short oil and some medium length oil alkyds whereas the much less toxic aliphatic hydrocarbon solvents are used for short oil alkyds.

In addition to benzene, toluene, and the xylenes, there are a variety of other aromatic solvents now available. Ethylbenzene, for example, is a solvent boiling in the range of 136°C. which resembles xylene in many ways. Isopropylbenzene, which is the basis for the cumene process for phenol and acetone, is also available as a solvent boiling in the range of 147-155°C.

Cyclic solvents which are not aromatic include cyclohexane, which boils in the same range as benzene, but is less toxic. It is miscible with most lacquer solvents and is a powerful solvent for resins. Methylcyclohexane boils in the range of 96-102°C. and may be produced by the hydrogenation of toluene.

The hydrogenation of naphthalene leads to tetrahydro- and decahydronaphthalene. These are known commercially as "tetralin" and "decalin" respectively. Tetralin is a solvent for oils, resins, waxes, rubber, polyvinyl chloride, asphalt, and linoxyn. Decalin has less solvent power but is miscible with most organic solvents.

The hydrocarbon solvents are the "work horses" of the paint industry and are the most widely used of all solvents. The advent of new vehicles and resins, however, has required solvents with greater solvent

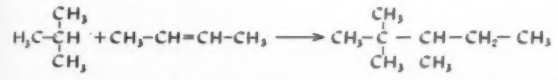
power and thus the paint industry has looked to chlorinated and nitrated hydrocarbons to ketones, esters and ethers for the answers. Even when these materials are used, however, their concentration is kept to a minimum because of cost and as much hydrocarbon as possible is included in the formulation.

Odorless Hydrocarbon Solvents

The advent of the latex paints, which are free of the conventional paint odor, emphasizes the need for solvents for oil paint with a greatly decreased odor level. Actually, the use of odor-free hydrocarbon solvents has been one of the important sales tools which the oil paint manufacturer has used to combat the popularity of the latex based paints.

The odorless hydrocarbons useful to the paint industry are prepared synthetically by petroleum refiners by a process known as alkylation. This process was designed primarily to make high antiknock quality aviation and motor gasolines. This is still its major use, but the production of odorless thinners serves as a small but important by-product operation.

The alkylation reaction can be demonstrated by the reaction that takes place between an isoparaffin such as isobutane and an olefin such as butylene in the presence of a powerful alkylating agent, such as sulfuric acid or hydrocloric acid, to provide 2,2,3-trimethylpentane.



In the actual operation, of course, mixtures of numerous saturated and unsaturated hydrocarbons are used, and the reaction goes in many different ways to produce a wide variety of branched chain materials. The bulk of the product which results boils in the range of gasoline and provides the basis of the fuels which are so important for aircraft and particularly for military planes.

The odorless thinners available commercially are obtained from the portions of the product boiling between 340°F. to over 600°F. Three main categories exist, including the "light" odorless solvents which boil between 340 and 390°F., the "heavy" odorless solvents which boil between 400 and 460°F., and the "intermediate" odorless solvents which boil between 350 and 415°F.

The low odor of these solvents is attributed to the fact that they are completely paraffinic—that is, nonaromatic. In addition, they are isoparaffinic or branched, and the branching contributes to a very low odor level. On the other hand, because the material is completely paraffinic, it has relatively poor compatibility. Also, the tertiary hydrogen atoms, which are present because of the branch chain structures, can be peroxidized with the subsequent development of a rancid odor. Accordingly, these thinners must be protected from oxidation with inhibitors.

The problem of poor compatibility is, of course, the most critical one. Important strides have been made in improving compatibility in the last two years, and even more important results can be anticipated in the future. The problem is also being solved by redesigning vehicles and by the use of certain additives which help to augment solvency power.

Hydrocarbon Derived Solvents

In the category of hydrocarbon-derived solvents must be considered the chlorinated and the nitrated hydrocarbons. The common nitro hydrocarbons include nitromethane, nitroethane, 1-nitropropane, 2-nitropropane, and nitrobenzene. All except the last one are aliphatic and as indicated previously are derived by the nitration of propane. Nitrobenzene results readily from the nitration of benzene.

The nitropropanes are solvents for cellulose nitrate, cellulose acetate-butyrate, ethyl cellulose, benzyl cellulose, ester gum, various synthetic rubber materials, polyvinyl acetate, polyvinyl acetals, vegetable and castor oils, and low boiling hydrocarbons. In the presence of alcohol, nitropropane will dissolve cellulose acetate and cellulose acetate propionate. The nitroalkanes are not solvents for materials like cellulose triacetate, rosin, waxes, or high boiling hydrocarbons.

There are numerous halogenated solvents of petrochemical origin. Most of these are quite toxic. These include ethyl chloride, methylene chloride, the chlorinated butanes, ethylene dichloride, ethylidene dichloride, the chlorinated pentanes, chlorobenzene, chloroform, benzyl chloride, trichloroethylene, trichloroethane, carbon tetrachloride, trichlorofluoromethane (Freon 11), dichloropentane, and orthodichlorobenzene. Not all of these, of course, find application in protective coatings. Methylene dichloride is used as a solvent for cellulose esters. It is also a solvent for polyvinyl acetate and polyvinyl chloride, as well as for methyl and ethyl cellulose.

Carbon tetrachloride is a desirable solvent because of its nonflammability. It is a solvent for fats, oils, asphalt, rubber, some cellulose ethers, phenolic resins, many natural resins, rosins and vinyl resins.

Dichloroethane or ethylene dichloride boils in the range of 84°C. It is a good solvent for rubber, certain natural resins, driers, alkyd resins, polystyrene, polyvinyl acetates, acrylic resins, mineral oils and vegetable oils. Acetylene tetrachloride or tetrachloroethylene is a solvent for cellulose acetate, certain natural resins, and fatty acids. Dichloroethylene is a solvent for cellulose acetate, ester gum and certain natural resins.

Chlorobenzene, which boils in the range of 130°C. is one of the least toxic chlorinated solvents being considerably less toxic than benzene. It is a solvent for certain rubbers, phenolics and vinyl resins. It is also useful in lacquer formulations.

Ketones

The ketone solvents of petrochemical origin include acetone, methyl ethyl ketone, methyl propyl ketone, diethyl ketone, mesityl oxide, cyclohexanone, methyl isobutyl ketone, methyl-n-butyl ketone, methyl-n-amyl ketone, diacetone alcohol, acetophenone, methyl-n-hexyl ketone, isophorone, and diisobutyl ketone. These are all powerful solvents for cellulose derivatives, acrylic resins, vinyl resins, oils, hydrocarbons and related materials. Their usefulness in protective coatings has been widely explored and specific recom-

mendations for their use are made by the manufacturers of various vehicles which require ketone solvents. Important among such vehicles are cellulose-derived lacquers, epoxy resins, acrylics, and vinyl resins.

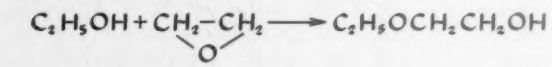
Esters

The ester solvents initially made nitrocellulose lacquers feasible; for, prior to their availability, lacquer formulations could be obtained with only extremely low solids contents. Esters made possible the achievement of higher solids content, thus making lacquers practical. Included among the esters of petrochemical origin are, methyl formate, ethyl formate, methyl acetate, ethyl acetate, propyl acetate, isopropyl acetate, butyl acetate, n-butyl acetate, secondary butyl acetate, isobutyl acetate, ethyl lactate, methyl Cellosolve, amyl acetate, Cellosolve acetate, ethylene glycol diacetate, n-butyl lactate, 2-ethyl hexyl acetate, Carbitol acetate and butyl Carbitol acetate. Like the ketones, the esters are powerful solvents which are extremely valuable for the vehicles which are difficult to dissolve.

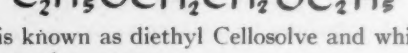
Ethers and Ether Alcohols

Ethers are also powerful solvents and find application in the formulation of lacquers and a variety of specialty coatings. This applies also to the ether alcohols which result from the self-condemnation of epoxy compounds like ethylene or propylene oxide. Included in the ethers from petrochemical sources are dioxane, ethyl butyl ether, diethyl Cellosolve, n-butyl ether, amyl ether, diethyl Carbitol, dibutyl Cellosolve, n-hexyl ether, and dibutyl Carbitol. The ether alcohols of petrochemical origin include methyl Cellosolve, "Dowanol 33B", Cellosolve, Butyl Cellosolve, Methyl Carbitol, Phenyl Cellosolve, dipropylene glycol monomethyl ether and tripropylene glycol monomethyl ether.

The chemistry of the ethers and the ether alcohols tends to become a bit confused because trivial rather than systematic nomenclature is employed. Cellosolve, for example, results when ethyl alcohol is condensed with one mole of ethylene oxide, according to the following equation:

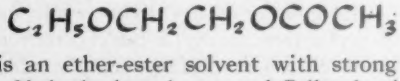


It can be seen that Cellosolve is an ether alcohol because it contains one ether group and one alcohol group. When the alcohol group is further etherified, however, the following compound results,



which is known as diethyl Cellosolve and which contains two ether groups.

The hydroxyl group of Cellosolve may also be esterified with acetic acid to provide Cellosolve acetate,



which is an ether-ester solvent with strong solvent power. If the hydroxyl group of Cellosolve is etherified with a butyl or a vinyl group, butyl or vinyl Cellosolve result.

Alcohols

There are a wide variety of alcohols of petrochemical origin, many of which find application in the formulation of lacquers, and other protective coatings. Included among these are methanol, ethanol, n-propyl alcohol, isopropyl alcohol, ethylene glycol, n-butyl alcohol, secondary butyl alcohol, isobutyl alcohol, propylene glycol, amyl alcohol, 3-pentanol, isoamyl alcohol, 1,3-butanediol, cyclohexanol, n-hexyl alcohol, methyl amyl alcohol, 2-ethylbutyl alcohol, diethylene glycol, benzyl alcohol, methylcyclohexanol, 3-heptanol, 2-methyl-2 4 pentanediol, methylphenylcarbinol, N-octyl alcohol, 2-hexyl alcohol, and 2-ethyl-1,3-hexanediol.

Miscellaneous Solvents

Among the miscellaneous solvents of petrochemical origin which find some use in the petrochemical industry are acetonitrile, formamide, dimethylformamide and carbon disulfide.

PIGMENTS

Of the estimated 700 million dollars which the paint industry spent for raw materials in 1956, 221 million was spent for pigments and dyes. Pigments fall into two classes—inorganic and organic. The petrochemicals industry, of course, makes virtually no contribution to the inorganic pigments, with the exception of carbon black, which results from the combustion of certain hydrocarbon fractions to obtain the finely divided carbon which serves as a black pigment.

Organic pigments, on the other hand, draw heavily from the petrochemicals industry for some of their important building blocks. Traditionally, of course, organic pigments depended upon coal tar for their base. As petrochemicals have offered many of the same chemicals that the coal tar industry has in the past few years, the petrochemicals industry, too, has provided a basis for many organic pigments.

Although there are literally hundreds of intermediate compounds for the production of dyes and organic pigments, there are five basic building blocks upon which the entire industry is based. These chemical foundation stones are benzene, toluene, xylene, naphthalene, and anthracene. As our previous discussion has already indicated, all of these except the last are available from petrochemical sources. The point should be made, however, that petrochemical naphthalene is currently limited in availability.

Some of the more important derivatives of these five hydrocarbons which are important to the dye industry are phenol, aniline, nitrobenzene, chlorobenzene, nitrochlorobenzene, chloroaniline, cresol, cyclohexane, dodecylbenzene, phenylacetic acid, phthalic anhydride, salicylic acid and styrene.

Of particular importance is phthalic anhydride, which is the basis for the so-called phthalocyanine dyes which provide stable blues and greens.

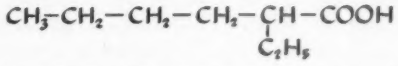
MISCELLANEOUS PRODUCTS

In addition to resins, solvents, and pigments, the petrochemical industry provides driers, polyhydric alcohols such as glycerol and pentaerythritol, and dibasic acids such as maleic and phthalic anhydrides.

Driers

Driers are metallic salts which catalyze the polymerization of the unsaturated linkages in drying oils. Thus, although they are minor constituents of oil-base paints, from the point of view of volume, they are extremely important from the point of view of performance. For without them, an oil would form a hard protective film at such a slow rate as to make drying-oil usage impractical.

Driers are metallic salts in which metals such as cobalt, manganese, lead, iron, calcium, zinc, copper or aluminum are combined with organic acids to obtain oil-solubility. Included among the acids which are used for the preparation of driers are unsaturated fatty acids such as linoleic acid, certain rosin fractions, tall oil acids or whole tall oil, naphthenic acids, and octoic acids. Of these, the last two are petrochemical-based. The octoates are organic salts of 2-ethyl hexoic acid whose structure is indicated below:

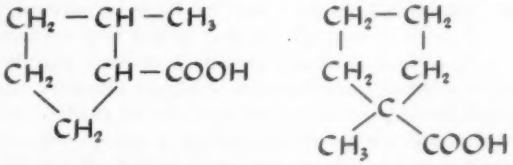


The branched chain structure is necessary since metal salts of straight chain, eight carbon acids are insoluble in oil.

The salts of 2-ethylhexoic acids are soluble in petroleum solvents as well as most protective coating vehicles. One of the big advantages of these materials is their almost complete lack of odor. Also, since the acid is produced synthetically, it is quite uniform and its salts are pale in color. The octoates catalyze drying under conditions of high humidity. They are particularly recommended for use with air-drying silicone finishes where they promote cross-linking of the silicone resins by actually participating in the polymer formation.

Because the acid is completely saturated, the octoate salts are stable against atmospheric oxidation which tends to produce discoloration and sludge formation.

Probably the most widely used driers today are based on naphthenic acid. Like the octoates, the naphthenates are completely saturated and, thus, do not suffer the adverse effects of oxidation. Typical naphthenic acids may have the following structures:



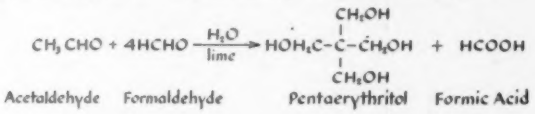
Naphthenic acids are, of course, mixtures and all of them do not have the simple structures indicated in the above formulas, although five-membered rings appear to be preferred.

In order for the naphthenic acids to be suitable for drier formation, they must be refined by distillation. In addition to their stability, they are desirable because the ring structures make them soluble in virtually all protective coating vehicles and in most types of thinners.

Polyhydric Alcohols

The most important polyhydric alcohol for the protective coatings industry is glycerol. The production of glycerol by petrochemical means has already been discussed above under the description of the chemistry involved in epoxy-resin formation. Glycerol, of course, finds its widest use in the production of alkyds. In 1955, approximately 228 million pounds of glycerol was produced and 30 per cent of this was utilized for the preparation of alkyd resins and ester gums. Another ten to twelve per cent was used for the production of synthetic drying oils by esterification with unsaturated fatty acids. It is interesting to note that the explosives and tobacco industries are the second largest consumers of glycerol, but each accounts for only twelve per cent of the total produced. Of the estimated 235 million pounds of glycerol produced in 1956, approximately 146 million pounds was produced synthetically.

The second most important polyhydric alcohol for the protective coatings industry is pentaerythritol. This is condensation product of formaldehyde and acetaldehyde as the following equation indicates:

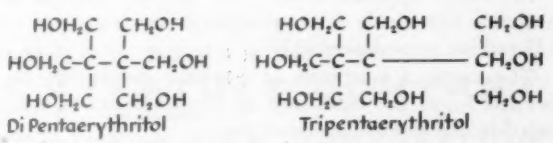


Actually, the protective coatings industry consumes approximately 94 per cent of the total pentaerythritol produced, which in 1955 amounted to 65 million pounds. It has been forecast that pentaerythritol production will reach 90 million pounds by 1960. The only other major application for pentaerythritol is for the production of the tetranitrate, which is an explosive. In peacetime, this application is small.

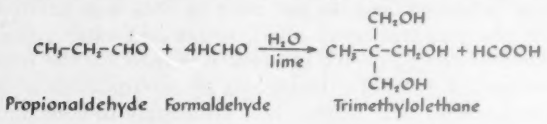
Pentaerythritol, which has a higher degree of functionality than glycerol, is desirable for the formulation of alkyd resins because it contributes greater durability and short drying time. Also, all of its hydroxyl groups are primary, which makes for easier esterification and, for shorter cooking times.

The net result of the higher functionality, in addition to shorter drying time and higher durability, are excellent gloss, hardness, and flexibility. One of the initial advantages of pentaerythritol was its price stability. Glycerol, however, can now claim the same advantage due to the stabilizing effect of the synthetic product.

In the synthesis of pentaerythritol, four molecules of formaldehyde and one molecule of acetaldehyde are theoretically required. In actual practice, a slight excess of formaldehyde is employed. Lime is the usual catalyst, and the reaction goes at the low temperatures of 40-50°C. The lime is thereafter precipitated as calcium sulfate, and the pentaerythritol solution is evaporated so that the product may crystallize. During the course of the production and purification of pentaerythritol, higher condensation products, such as di- and tripentaerythritol whose structures are indicated below, are also isolated:

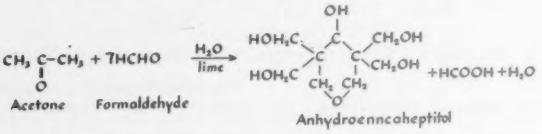


The same type of condensation which provides pentaerythritol can also provide a variety of other polyhydric alcohols. Thus, the condensation of formaldehyde and propionaldehyde leads to trimethylolethane, as the following equation indicates:



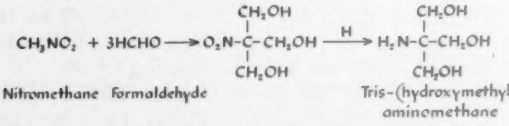
Like glycerol, this product has three hydroxyl groups. Since all of them are primary, esterification rates are more rapid and acid numbers tend to be lower. Also, the additional methyl group provides improved solubility.

The condensation of acetone and formaldehyde leads to a cyclic compound known as anhydroenneaheptitol. The equations leading to the formation of this interesting material are indicated below:



This compound, which has four primary and one secondary hydroxyl groups, has been introduced recently on a development basis as a potential polyhydric alcohol for alkyd formation.

Another interesting compound which has aroused some interest in the protective coatings field is tris-(hydroxymethyl)-aminomethane. This compound results from the reduction of the condensate, which forms by reacting formaldehyde and nitromethane. The equation follows:



It is of interest because the amino as well as the hydroxyl groups can react with fatty acids.

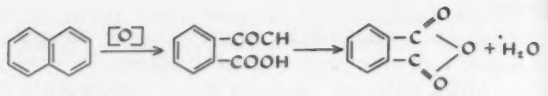
Still another alcohol which has been suggested for use in the alkyd industry is 1,2,6-hexanetriol. This results when acrolein is dimerized and then hydrolyzed and hydrogenated.

Dibasic Acids

Without question, the most important dibasic acid produced by the petrochemicals industry for use in protective coatings is phthalic anhydride. Of the 800 million pounds of resins used by the protective coatings industry in 1956, 50 per cent of them were alkyds based on phthalic anhydride. In addition to this important use, phthalic anhydride is basic for the production of phthalocyanine pigments and also for the production of the most important esters used as vinyl and other types of plasticizers.

In 1955, approximately 331 million pounds of phthalic anhydride were produced as compared to 137 million pounds in 1947.

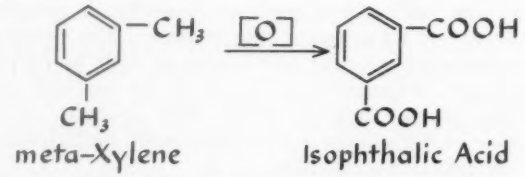
The original synthesis of phthalic anhydride depended upon the oxidation of naphthalene, as indicated in the following equations:



Actually, there does not seem to be sufficient naphthalene to provide all of the phthalic anhydride required, and several times during the past ten years, phthalic anhydride has been in short supply because of this situation. The raw material shortage is accounted for by the fact that the bulk of the naphthalene produced thus far comes from the coking of coal. This industry has not expanded at a rate sufficient to keep up with the expanding need for phthalic anhydride. Naphthalene, of course, may also be produced from petrochemical sources, although the actual production thus far has been very small.

The answer to the phthalic anhydride shortage has been to find new raw materials. The logical one is ortho-xylene, which is, of course, petrochemical-based. Ortho-xylene, like naphthalene, may be converted to phthalic anhydride by an air oxidation in the presence of a supported vanadium pentoxide catalyst at temperatures of 350-450°C.

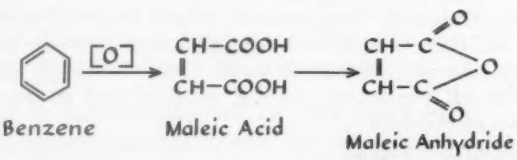
Of great interest to the protective coatings industry is isophthalic acid, which is produced by the oxidation of meta-xylene, as the following equation indicates:



The important difference is that since the carboxyl groups are not adjacent, the anhydride formation does not take place as it does with the ortho-isomer. Thus, isophthalic acid is always available in the form of free acid, which means that in alkyd cooking an extra mole of water must be removed.

The first isophthalic acid was produced commercially in this country late in 1955 in a plant whose capacity is rated at 50 million pounds per year. Isophthalic acid is said to have an advantage over phthalic anhydride in that it has less tendency to sublime and demonstrates greater heat stability. Also, isophthalic alkyds have a higher viscosity than normal alkyds, which means that the oil content may be increased while still achieving a given viscosity. Actually, ten to fifteen per cent longer oil length is permitted while still maintaining viscosity equivalent to that of the normal phthalic alkyds.

Maleic anhydride results from the oxidation of benzene according to the following equation:



The capacity for maleic anhydride production has

(*Turn to page 66*)

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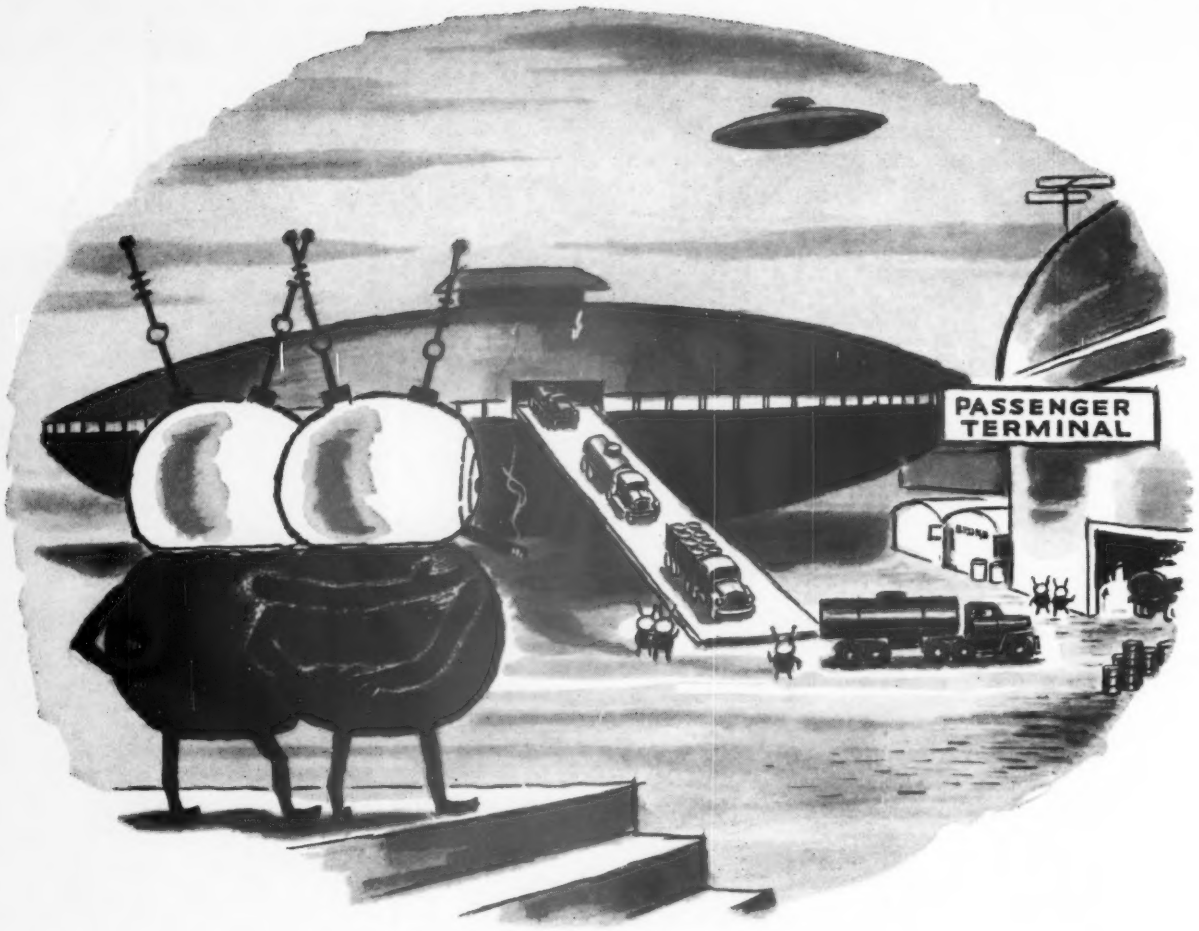

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LOW REFRACTIVE INDEX PIGMENTS

New class of synthetic low reactive index pigments finds use in polyvinyl acetate emulsion paints

By
S. Lauren
C. R. Vander Linden

THE application of modern chemical engineering techniques in the recently completed Johns-Manville plant at Lompoc, California has made possible the conversion of diatomaceous silica into a new class of synthetic low refractive index pigments. These pigments are synthetic hydrated calcium silicates quite unlike the naturally occurring anhydrous calcium silicate wollastonite. Hydrated calcium silicates are extremely rare in the earth's crust. Most of the naturally occurring hydrated calcium silicates (for example, xonotlite, gyrolite, riversidite, foshagite, hillebrandite), are costly mineral collectors' specimens, so sparsely disseminated in nature that anything resembling a commercial deposit is inconceivable. Thus the commercial availability of hydrated calcium silicates has been possible only through the development of a synthetic process.

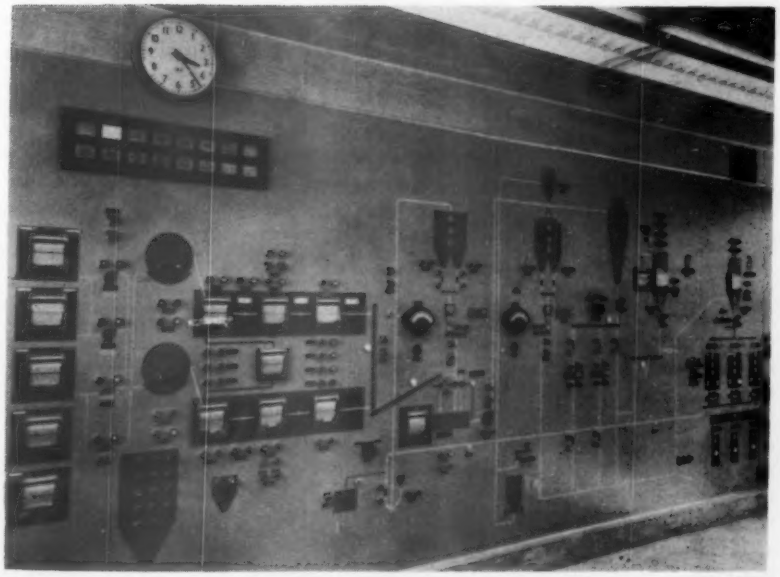

Figure 1. Control panel for producing synthetic hydrated calcium silicate.

The formation of these hydrated calcium silicates, known as "Micro-Cel", is accomplished in a hydrothermal reaction of diatomaceous silica, hydrated lime and water. The materials are brought together in a high pressure reactor and are caused to react under the closely controlled temperature, pressure, concentration and agitation conditions required to result in specific chemical compounds having the desired chemical and physical characteristics. When the reaction has been completed, the slurry is discharged from the reactor and is filtered on a rotary vacuum filter to remove

This article is a contribution of the Johns-Manville Research Center, Johns-Manville Co., Manville, N. J.

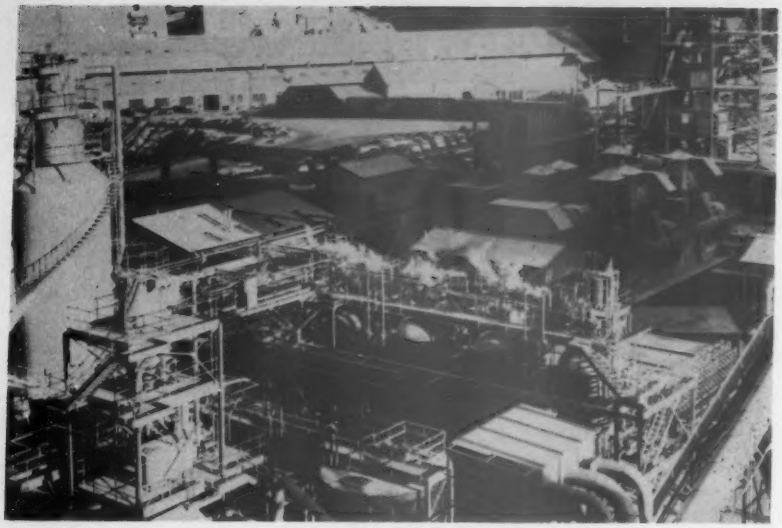

Figure 2. Overall view of Johns-Manville silicate manufacturing plant.

the insoluble calcium silicate from the water. This filter cake is then dried, pulverized, and packaged; the final products are finely divided powders.

The plant is highly instrumented. The major portion of the operation is controlled from one of the two control rooms, each containing a graphic panel control system for half the plant. The vast array of lights, indicating and recording instruments, and alarms which sound if the desired conditions are not sustained, makes it possible for the skilled operator to follow the operation of the portion of the plant in his charge with only infrequent inspection of the actual operating equipment. A photograph of one of these control panels is shown in Figure 1. An overall view of the silicate manufacturing plant is shown in Figure 2. This plant was built on a portion of the site where diatomaceous silica has been mined and processed into "Celite" filter aids and filler products for over 50 years. It is interesting to note that the deposits of diatomaceous silica are so extensive in this area that the entire plant is built on top of this raw material.

Uniform product quality is made possible by exacting quality control. All raw materials are tested prior to use in the reaction. The physical and chemical characteristics of the slurry from the reactor are measured before the slurry is further processed. The chemical characteristics are determined by chemical analyses and by X-ray diffraction measurements which assure that the reaction has resulted in a calcium silicate with the proper molecular structure. The finished product also is subjected to rigorous tests which involve measurement of bulk density, absorption, particle size, color, pH, and moisture content, in addition to rechecking of the molecular structure by X-ray diffraction.

"Micro-Cel" products are very finely divided hydrated calcium silicates. Several grades of "Micro-Cel" can be manufactured by changing the synthesis conditions. Typical properties of four of these grades are shown in Table 1. These grades differ in both chemical and physical characteristics. The small particle size and the striking differences between grades is apparent from the electron micrographs of "Micro-Cel C" and "Micro-Cel E" shown in Figures 3 and 4.

Properties

Two of these products, "Micro-Cel C" and "Micro-Cel E", exhibit unusual properties when incorporated in paint formulations. But the various hydrated calcium silicates have utility in numerous other fields as well. Some of these are:

Liquid Absorbents. "Micro-Cel" will absorb three to four times its weight in liquid and still remain a free-flowing powder. Difficult-to-handle liquids can be converted to powders for subsequent use by consumers. More uniform blends of a large mass of solids and a small amount of liquid can be made by first absorbing the liquid onto "Micro-Cel" and then blending this powder into the large mass.

Grinding Aid. "Micro-Cel" may be added to heat-sensitive materials that must be ground. It prevents caking in mills, results in

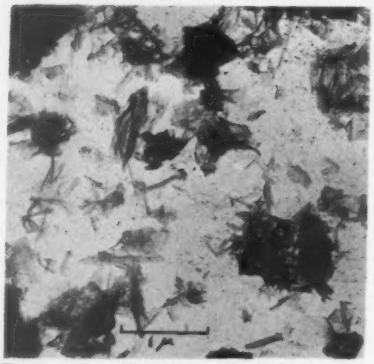

Figure 3. Electron micrograph of "Micro-Cel C."

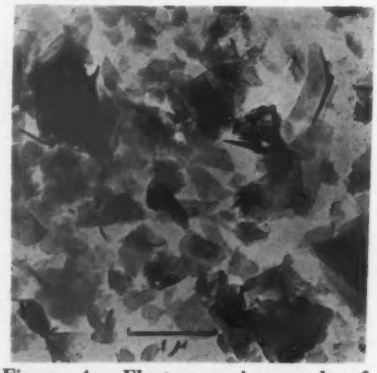

Figure 4. Electron micrograph of "Micro-Cel E."

	Micro-Cel C	Micro-Cel E	Micro-Cel A	Micro-Cel B
Color	White	Off-white	Off-white	Off-white
Refractive Index	1.53	1.55	1.53	1.53
Specific Gravity (true)	2.26	2.45	2.33	2.2
Bulking Value lbs./gal.	18.9	20.5	19.5	18.4
Oil Absorption, % (Gardner-Coleman)	380	490	375	220
Screen Analysis* (ASTM 185-45)	1.1%	0.3%	0.5%	3.2%

*Percent (average) retained on 325 mesh screen

Table 1. Typical properties of "Micro-Cel" products.

finer grinds, and improves flowability of finished products.

Bulking Agent. It may be employed to fluff a compounded powder and to prevent settling on storage. Its high dry bulk and unique structure may be used to increase the porosity of products such as paper.

USES IN PAINT

Study of the chemical and physical properties of the "Micro-Cel" products has revealed several characteristics that are of substantial interest in paint applications. Especially notable is the capacity of "Micro-Cel", even in low concentration, to boost the pH of polyvinyl acetate emulsion paints, and then, with long-lasting buffering action, to maintain mild alkalinity. Although emulsion paints on the alkaline side must still be packaged in lined cans, they are less aggressively corrosive than acidic media and are therefore less damaging in the presence of pinholes in can linings. Mild alkalinity in maintaining good dispersion of certain pigments is also recognized.

Further investigation of "Micro-Cel C" in polyvinyl acetate paint has revealed another effect, in addition to pH boost and stabilization, that points to the possibility of substantial savings in raw material cost. With concentrations as low as 30 pounds of "Micro-Cel C" per 100 gallons in conventional PVAc white paint formulations, both wet and dry hiding power are increased significantly. This effect has been observed with both homopolymer and vinyl acetate copolymer emulsions, with emulsions of medium, fine and very fine particle size, and at pigment volume concentrations from 30 through over 60 per cent. Photographs of this effect are shown in Figures 5 and 6 (see Table 3) and a representative formulation is given in Table 2.

Hiding Power

A quantitative indication of the extent of the hiding power contributed by "Micro-Cel C" in polyvinyl acetate paint is given by the following example: A vinyl acetate copolymer paint was prepared at 39 per cent PVC, with 200 pounds of rutile TiO_2 per 100 gallons, and with the remainder of the pigmentation consisting of approximately equal parts of talc and whiting. The opacity of this paint was matched with a formulation at the same PVC, with 30 pounds of "Micro-Cel C" per 100 gallons replacing an equal volume of talc, and with a rutile TiO_2 content of 155 pounds per 100 gallons (instead of the original 200 pounds).

In another instance, use of a special grade of "Micro-Cel" made it possible to replace twice its weight of TiO_2 in a white casein insulating board coating, resulting not only in no sacrifice in opacity, but even in the appearance of better whiteness.

An interesting observation is that use of "Micro-Cel C" at the 30 pounds per 100 gallons level in PVAc paints, in the presence of normal concentrations of the usual pigment dispersing agents, results in viscosities only 3 to 5 K.U. higher than in similar paints without "Micro-Cel". However, higher concentrations of "Micro-Cel" do

(*Turn to page 70*)

	lb/100 gal
Rutile TiO_2	150.0
Micro-Cel C	30.0
Nytal 300	100.0
Snowflake	110.0

	lb/100 gal
Rutile TiO_2	150.0
Micro-Cel C	0.0
Nytal 300	136.0
Snowflake	110.0

	lb/100 gal
Rutile TiO_2	200.0
Micro-Cel C	35.0
Nytal 300	123.0
Snowflake	140.0

	lb/100 gal
Rutile TiO_2	200.0
Micro-Cel C	0.0
Nytal 300	164.6
Snowflake	140.0

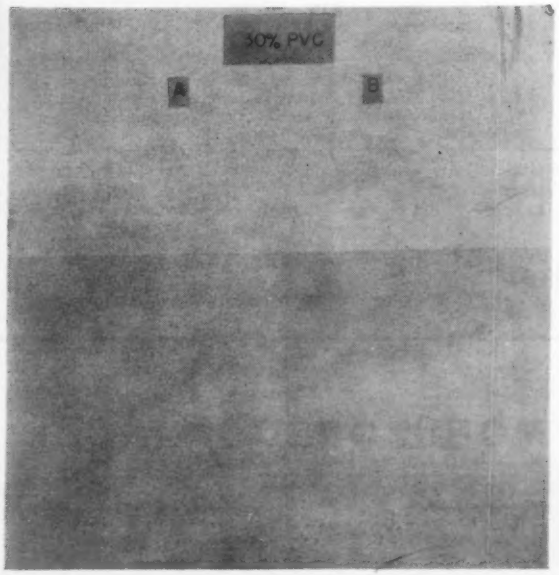

Figure 5

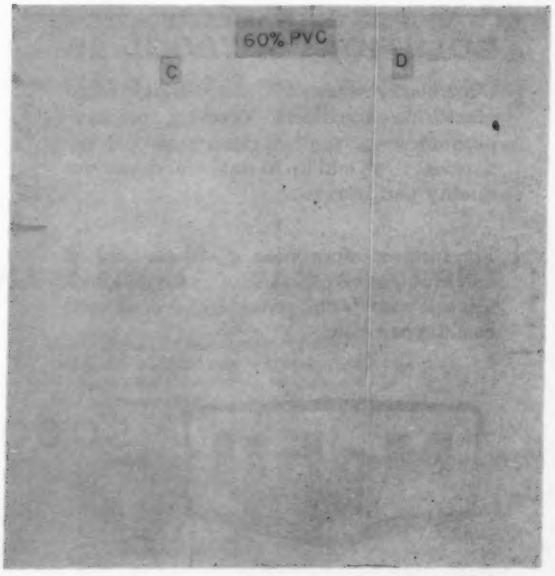

Figure 6

Drawdowns showing hiding power of polyvinyl acetate paints using "Micro-Cel C."

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	50%	360
	90%	371
	ASTM End Pt.	405
	Drying Time	200 minutes (Toluol, 20 minutes, under same test conditions).
	Flash Point, TCC °F	120
Solvent Power -	Aniline Point, °F	184
	Kauri Butanol No.	26
Weight -	Gravity, °API	55.5
	Gravity, Specific 60/60°F.	.7567
	Gravity, lbs/gal 60°F	6.30
Purity -	Sovasol 35 is water white in color and passes all pertinent stability and copper corrosion tests. It is practically odorless, is doctor sweet and is relatively color stable.	
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	Toxicity - Relatively low order of toxicity but avoid prolonged contact with skin or excessive inhalation of vapors. (Further details upon request.)	
	Shipping Regulations—No ICC Red Label required.	

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EPOXY-BASED MASONRY MATERIALS

By

Philip Maslow*

Part III-Epoxy Resins in Concrete Construction and Repair

THE mounting number of highway deaths, the increasing property losses and the steadily increasing concentration of vehicles on the roads, together with the expanded program of road construction undertaken by Federal and State governments, all combine to concentrate attention on the problem of making the roadways themselves safer. One of the most effective ways to approach this problem is to provide high friction to the surface. Although this property is a primary objective, it is also important to provide good wearing qualities and protection for the roadway from the effects of water, de-icing salts, oils, greases and seasonal freezing and thawing.

Road Applications

The epoxy resins are ideally suited to road applications because they possess properties of excellent adhesion to Portland-cement concrete and other paving materials, high mechanical strengths, water impermeability and chemical resistance. A very important property also is that the coefficient of expansion of a filled, hardened liquid epoxy resin is approximately equal to that of Portland-cement concrete. Basically, the epoxy resin compound represents a third type of roadway paving cement to supplement Portland cements and bituminous cements. The compound, when hardened, has high tensile strength—in contrast to that of Portland or bituminous cements. Unlike the bituminous, it has no flow even under high temperatures and heavy loads.

In addition to the uses of the epoxy paving compound to resurface roadways, several new developments in connection with the same area of application have also been developed. Sealing membranes, based on liquid epoxy resins, are utilized to provide a bond between a concrete road bed and an asphalt topping, to prevent penetration of water and de-icing salts through faults in the asphalt and water penetration from the ground through the concrete—both of which act to loosen the asphalt topping. Traffic lines with excellent wearing qualities are being formulated both from conventional amine-cured, hard epoxy resin systems in solvent and from filled liquid resins which can lay down a more or less permanent, cast-in traffic line. Audible warning strips have been laid down at danger points with liquid epoxy resins filled with coarse, pebble-size aggregate. Roadway defects, commonly called pot-holes, are now being permanently repaired with highly adherent epoxy patching compounds; and surface cracks can be sealed with unfilled liquid epoxy resin systems. Traffic reflectors and reflection strips may be cast in liquid epoxy resins. And, of course, the epoxy resins may be used to bond a new layer of concrete to old concrete.

The high friction application to roadways is used primarily to de-slick roads polished by traffic, especially in critical areas. Among these areas, we may include toll road exits and entries, toll booth approaches, bridges and other quick-freeze areas, traffic intersections, slow and stop areas, sharp curves, bus stops, and tunnels. A road coated with an epoxy resin high friction overlay will show higher frictional coefficients, both dry and wet, then new Portland cement and bituminous concrete roads and will retain its rough surface for longer periods of time, even under dense traffic conditions. Winter weather has

*Ciba Company Inc., Supervisor, Coatings Laboratory, 116 East 16th Street, New York 3, N. Y.

no serious effect on the performance of epoxy cement pavement. Its cost, considering its use in thin layers compares favorably with resurfacing costs using Portland cement or asphaltic concrete. De-slicking in thin layers also eliminates the necessity of raising manholes, sewers, curbs and separating barriers in road repair operations.

The condition of the surface will usually determine the thickness of the resinous layer to be applied. If considerable uneveness caused by wear is present, a thick layer is required to fill the holes. Thicknesses up to one-quarter inch may be applied. In such a situation, the flooring compound, as described in Part II (June issue), may be used. This is the resin-sand mixture which is applied by a screed and trowel method. For a smooth roadway, a thinner layer performs just as well, and at a considerable reduction in material costs. Thicknesses from 1/16 inch to 3/32 inch are applied. In addition, manual labor in application need not be used. Thin layers are obtained by applying the basic resin-hardener mix, such as described in the section on the flooring compound. A low viscosity liquid epoxy resin will make up the first component. A hardener combination similar to the one used in the flooring compound may be used. However, since roads must be opened to traffic in a short period of time, a fast curing amine such as triethylene tetramine is often used. This also contributes to low viscosity of the mixture. The thin layer of clear resin is applied by spray, brush, or by a mechanical applicator. As the clear resin is applied, a coarse aggregate is then strewn over the area. The aggregate will penetrate the film and be tightly bound as the matrix gels. Very often a roller will then be used at this stage to pack the aggregate into the matrix and to smooth out the surface. The unmodified resin-hardener mixture combined with sand has a color similar to Portland cement. It may be tinted even closer to resemble cement. Traffic lines may be tinted white or yellow.

Two conditions must exist for successful application of epoxy resin cements of all types and modifications —the substrate must be strong and sound and it must be dry and clean and free from oil, grease and other road containments. There have been tests devised to check the tensile strength of a surface to be repaired, tests which provide a means of determining the bonding strength of the epoxy cement to the roadway. The tests determine weakened concrete substrates and should be used before any large scale application is started. The tests usually depend upon the application of a quick curing epoxy resin mixture to the surface and sealing a hooked device into the patch. When curing has taken place, tension is applied to the hook and the load at which the hooked device and the patch separate from the substrate is taken as the stress range. Usually failure occurs in the substrate itself, with Portland cement concrete having a stress range of 150-600 psi and bituminous concrete a lower range of 50-150 psi. In setting standards for Portland cement and bituminous concrete, it may be indicated that surfaces having strengths less than the lower limits are considered a risk for retopping. These tests may be used to check toppings on pavement after periods of aging and they invariably show that the bonding strength of the coating is greater than the cohesive strength of the substrate.

Cleaning of roadway surfaces is as important as determining the condition of the substrate. On Portland cement concrete areas where a normal amount of traffic soil is present, cleaning may be accomplished by applying a 10-15% solution of hydrochloric acid, using stiff-bristled brooms to loosen the soil. This process is then followed by a rinse to flush the surface free of acid. In cases of heavy caking of oil, grease and grime, a preliminary treatment with solvents such as trichlorethylene is recommended. Where necessary, more than one solvent treatment may be made. Often a mechanical abrasion is necessary for a badly soiled area. In all cases, a final treatment with acid and a water rinse should be made and the surface should be thoroughly dry before application of the topping.

Bituminous roadways which are subject to normal soil should be cleansed with mild (1-2%) solutions of alkaline detergents. For heavy soil, mechanical abrasion should be used along with the detergent solution. Acids may only be used when aggregate is present in the bituminous cement, where the acids will etch these materials. Solvents should never be used on bituminous roadways.

To summarize, the following procedures must be observed in road repair when using epoxy resins. Proper cleaning must be performed . Surfaces must be treated to yield minimum tensile strengths of 150 psi for Portland cement concrete and 50 psi for bituminous concrete before resurfacing. Proper modifications of the epoxy resins must be made and the proper aggregate must be used. And, of course, careful application with trained labor is highly important.

When these procedures are followed, epoxy toppings for highways should possess these qualities:

a. Long wearing properties in all climates.
b. Impermeability—to protect the original surface.
c. Resistance to freezing conditions, salts, water, greases, oils, and gasoline.
d. Permanent high friction under dry, wet, and oily conditions.
e. Light weight—important in resurfacing bridge roadways.
f. Fast curing to give minimum interruption of traffic flow.
g. Easily tinted or filled for traffic lines, light reflectance, audible warnings and directional markings.

Application on Concrete Pipe

Sewage systems in municipalities and industrial waste lines in chemical and food plants have always presented problems. Cast iron pipe, an old stand-by, presents problems of deterioration due to corrosion and consequent expensive replacement. Paint systems were entirely inadequate on cast iron pipe and painting was dispensed with for the most part.

Mr. Maslow presented a paper based on this series at the annual meeting of the Protective Coatings Div. of the Chemical Industries of Canada in Toronto, Ont., May 27, 1958.

Vitreous clay pipe is another widely used material in sewage systems. Vitreous clay pipe may be resistant to corrosion, but it presents many other problems. It is expensive, it is subject to excessive breakage and fractures may easily develop even in underground service. Vitreous clay also has relatively low resistance to penetration of hydrogen sulfide gas present in sewage.

Operation at a plant producing concrete sewer pipe prior to the final coating.

Concrete pipe is an inexpensive method of installing sewage lines. It is possible to cast concrete pipe with an inside diameter up to 42 inches and in lengths up to 20 feet. Concrete pipe is being used on an ever increasing level in new municipal and industrial sewage systems and as replacements for existing systems. However, concrete pipe has to be treated to prevent hydrogen sulfide penetration and water seepage. The most accepted method of lining the pipe is the use of a vinyl sheeting which is locked into place at the plant when the concrete is poured. The vinyl is mechanically bonded to the upper two-thirds of the interior surface—the area which is most subject to gaseous attack. This is a rather expensive method of lining a concrete pipe.

Another method of lining is the use of a vitrified clay liner applied mechanically to the upper two-thirds of the interior. This method also involves high labor and material costs, as well as time consuming methods of application. These partial liners involve the inherent danger of gas penetrating the space between liner and pipe; and in the case of vitrified clay, the relatively low resistance to gas penetration of the clay itself.

The use of liquid epoxy resins, properly formulated and applied, provides a method of lining concrete sewer pipes in plant or in the field. The epoxy linings are economical enough to be applied to the entire interior; they are highly resistant to most sanitary and industrial wastes; they permit no water seepage or penetration of sewage gases; they resist high hydrostatic pressure with no blistering, cracking or loss of adhesion; and they are resistant to bacterial and fungicidal attack.

Perhaps the most satisfactory formulations are based on liquid epoxy resins combined with polysulfide resins and catalyzed with tertiary amines. A typical epoxy resin used would be one having and epoxide equivalent of 196 and a viscosity of 14,000 cps. The epoxy resin may be pigmented with extenders and colors. This would constitute the resin portion. The hardener portion would be a blend of a polysulfide and 2, 4, 6-tri (dimethylaminomethyl) phenol (DMP-30), or triethylene tetramine.

Pipe may be coated in one of two ways—by knifing the epoxy-hardener blend or by spraying. In the knifing method, individual pipes are placed on rollers, the ends are blocked off at the circumference, a measured amount of resin-hardener mix is introduced and a knifing device spreads the coating while the pipe turns on the rollers. Film thickness may be up to 30 mils. The pipe is then set out to cure. Curing will be complete in 2-3 days at ambient temperatures.

For spraying application, there are devices utilizing multiple nozzles which pass through a pipe of any length and can apply coatings from 20-30 mils in thickness. For spray application, it is necessary to reduce the viscosity of the epoxy resin and this can be done with reactive diluents. A diluent which would maintain the essential features of a cured epoxy resin would be one having two oxirane rings, such as 1, 4 butane diol diglycidyl ether. The use of this diluent will not affect the hydrogen sulfide resistance.

There have been some very interesting laboratory tests developed for checking the adhesion, chemical resistance, and resistance to water absorption and permeability of hydrogen sulfide—of epoxy coatings applied to concrete sewer pipe.

The test for resistance to hydrostatic pressure may follow the one described in the section on epoxy masonry paints of high solids content for concrete and cinder block. The test employs a length of pipe attached and sealed to a block which had been completely coated. The height of pipe represents the amount of hydrostatic pressure applied. Another test involves the use of an actual coated concrete pipe. A section of pipe, one foot long and 8 inches in diameter, is coated on the inside and sealed at its open ends. It is then placed in a pressure tank.

Both of these tests indicate that the epoxy-polysulfide linings—25 mils in thickness, can resist an external hydrostatic head up to 40 feet without water seepage, with no cracks or blisters, with no loss in adhesion, and with the coating in good condition.

A test for hydrogen sulfide penetration may easily be performed in the laboratory. Glass panels, 3″ x 5″, are first coated with an acrylic emulsion containing 10% lead acetate to serve as an indicator for H_2S penetration. The panels are then coated with 25 mils of epoxy polysulfide liner. The panels are sealed at the edges with paraffin wax and placed in a dessicator to which H_2S gas is introduced under pressure. Similar panels may be prepared with vinyl coatings. Failure is judged as the first spots of discoloration appear.

At low pressures, the epoxy coating will show the first discoloration after 450 hours, the vinyl coating after 200 hours. At high pressures, the epoxy coating will show discoloration after 100 hours, the vinyl coating after 50 hours. The concentrations in sewage

(*Turn to page 67*)

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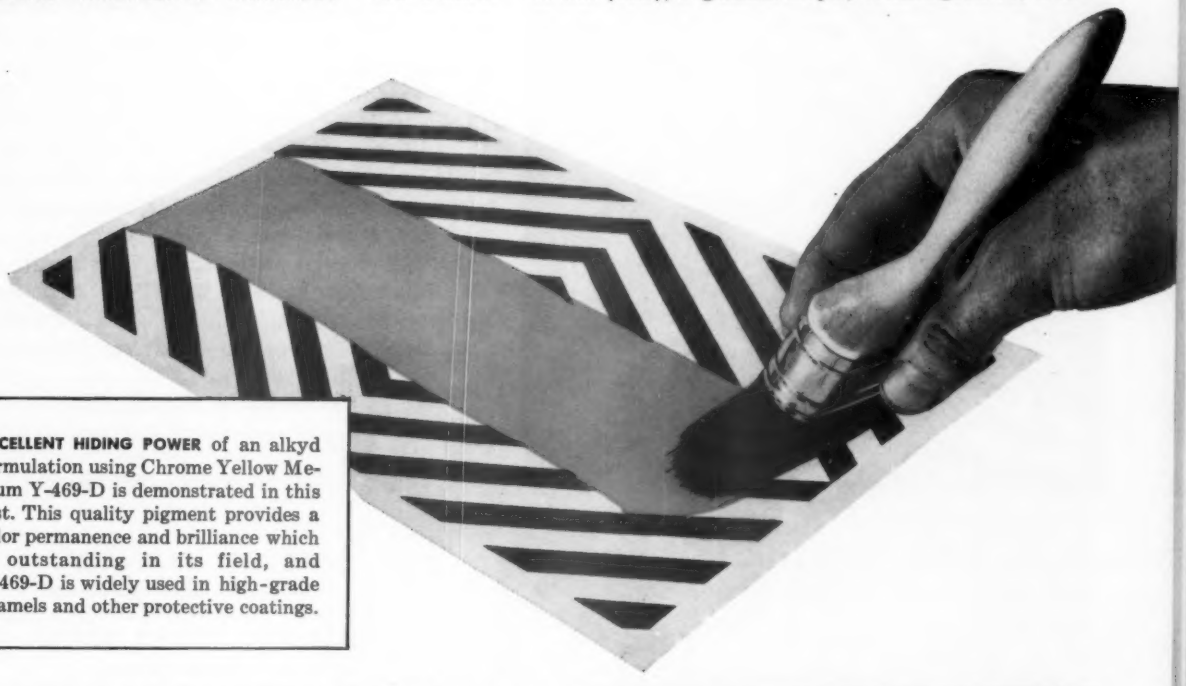
A brilliant shade range is yours with high-strength Du Pont Chrome Yellows—Light Y-433-D and Medium Y-469-D. These high-quality pigments grind and disperse easily, offer excellent lightfastness and film durability in both alkyd and lacquer formulations . . . important advantages for your trade sales and industrial finishes.

DURABLE, YELLOW-SHADE GREENS—Monastral® Green GT-751-D and Ramapo* Green GP-755-D offer maximum lightfastness, color brilliance and resistance to chemicals and bleed. And for your water-base paints, you get these same properties in Monastral® Green Paste GW-749-P.

VERSATILE MOLYBDATE ORANGES — Du Pont's Molybdate Oranges, yellow shade YE-637-D and red shade YE-698-D are soft-textured, lightfast pigments . . . offer great versatility when used as self-colors or blended with a variety of other pigments.

COLOR STANDARDIZATION—You can rely on the batch-to-batch uniformity of all Du Pont pigments to simplify your color matching. Year-round exposure histories on many paint formulations are available at the Pigments Department test farm. And Du Pont technical assistance is available on pigment colors and Ti-Pure® titanium dioxide pigments. For further information, consult your Du Pont Pigments representative, or write: E. I. du Pont de Nemours & Co. (Inc.), Pigments Dept., Wilmington 98, Del.



EXCELLENT HIDING POWER of an alkyd formulation using Chrome Yellow Medium Y-469-D is demonstrated in this test. This quality pigment provides a color permanence and brilliance which is outstanding in its field, and Y-469-D is widely used in high-grade enamels and other protective coatings.

Here are a few of the fine pigments in the Du Pont line offering the properties you require:

Ti-Pure® Titanium Dioxide
Green-Gold—Durable Organic Yellow
Monastral® Blues and Greens
Ramapo* Blues and Greens
Molybdate Oranges
Chrome Yellows
Zinc Yellow
Shading Yellow
Parachlor Red
Toluidine Reds
BON Reds and Maroon

*DU PONT TRADEMARK

to fine products everywhere

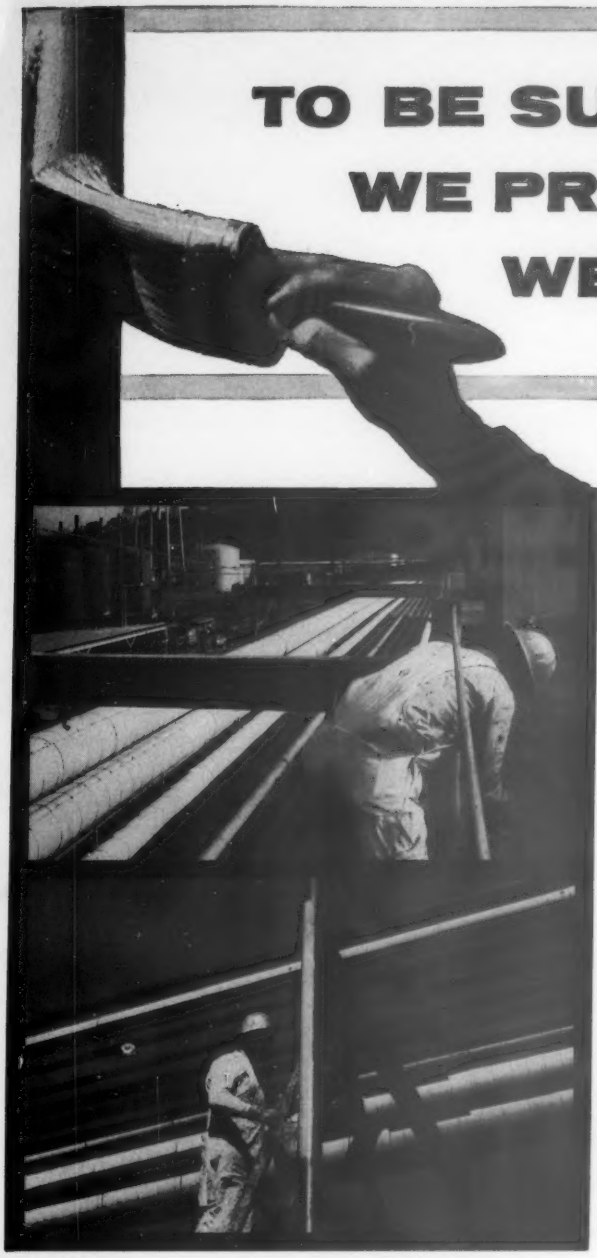
PIGMENTS DEPARTMENT

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

TO BE SURE... WE PRACTICE WHAT WE PREACH!



The photos above show painters applying "9200"-base primer, enamel top coat and blue aluminum paints to giant new Woodmar installation at Washington, West Virginia.

MARBON "9200"

Soluble High Styrene Resins

USED ON OUR MULTI-MILLION DOLLAR WOODMAR INSTALLATION

For unexcelled protection against the severe effects of weather and climate on tubing, piping, storage tanks and general outdoor installations, Marbon Chemical specified primer, enamel top coat and aluminum paints made with "9200" resins for the gigantic new Woodmar installation. In addition to having high corrosion resistance, these resins provide superior brush-on qualities, better coverage and easily controlled dry rate. They also supply desirable high gloss and film build.

For higher paint production . . . for greater package stability . . . use Marbon "9200"! Designed for simple cold-cut, stir-in manufacturing . . . in everything from clear lacquers to semi-flats—all at lower prices!

MARBON 9200 HV
for lower vehicle solids at higher viscosity

MARBON 9200 MV & LV
for general use

MARBON 9200 LLV
for higher vehicle solids at lower viscosity

MARBON 11953 RESIN
for low odor, low cost finishes

Get the facts . . . WRITE TODAY FOR TECHNICAL LITERATURE

PACESETTER IN
Marbon CHEMICAL
SYNTHETIC RESINS

Division of BORG WARNER • Gary, Indiana

also represented by:

WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.
CANADA: Dillons Chemical Co. Ltd., Montreal & Toronto
EXPORT: British Anchor Chemical Corp., New York

NEWS

Pulp Chemicals Assn. Elects Spitz & Radeker

A new trend in the use of tall oils was reported to members of the Pulp Chemicals Assn. at the recent annual meeting. Also, new officers for 1958-59 were selected.

R. J. Spitz

R. J. Spitz, vice president of Newport Industries Co., a division of Heyden Newport Chemical Corp., was elected president of the association, succeeding Albert Scharwachter who died this year.

Elected to the association's vice presidency was L. A. Radeker, Champion Paper & Fiber Co.

Officers of the association's tall oil division are A. B. Doran, Union Bag-Camp Paper Corp., re, elected chairman, and A. M. Rankin of Continental Can Co., Inc.-elected vice chairman.

In a review of 1957 operations, the association's members heard that the trend toward upgrading tall oil is continuing, with the higher proportion of tall oil going into fractionated products.

Glidden Purchases General

Dwight P. Joyce, chairman and president of the Glidden Co., and W. L. Watkins, president of General Paint Corp., announced that directors of the two companies had approved the purchase by Glidden of General Paint's paint business, with the exception of the operations conducted by General's wholly-owned subsidiaries in Mexico and the Republic of the Philippines.

General Paint's pipe-wrapping and coating division, known as Hill, Hubbell & Co., will also be retained by General.

Plans are for Glidden to acquire General Paint's brand names, inventories, paint processes and manufacturing facilities at Portland, Ore. and Tulsa, Okla., and various distribution outlets in the Pacific coast and southwest regions.

It is Glidden's intention to retain a great majority of General Paint's employees.

Colton To Sell Aerosols

Alpha Engineering Works, Inc. has completed arrangements for the Arthur Colton Co. of Detroit to sell, manufacture and service the complete Alpha line of equipment for packaging aerosol-type, pressure-dispensed products.

The equipment will be merchandising under the trade name, "Colton-Alpha." The Alpha organization will continue its engineering, research and development programs in the aerosol filling field.

Arthur Larkins Passes

Arthur Larkins, 75, industrial paint sales representative for the Suydam Division of Pittsburgh Plate Glass Co., died recently following and abbreviated illness.

Mr. Larkins had been associated with the paint industry for the past 57 years during which time his paint affiliations gained for him country-wide recognition throughout the industry.

Representative Named

The Philip E. Calo Co., Inc., Chicago and Minneapolis, has announced the appointment of William C. Murphy as service and technical sales representative.

Du Pont Opens New Sales Service Laboratory

Opening of a new five-million dollar laboratory to provide service to customers and for evaluation of new or improved products of the Du Pont Company's electrochemicals and pigments departments has been announced. The laboratory is located at Chestnut Run, near Wilmington, Del.

Although some facilities are shared jointly by the two departments, the building houses separate laboratories for product development in paint and allied chemical fields.

The laboratory contains 81,000 square feet of floor space. The technical staff of 130 includes chemists, chemical engineers and other specialists.

The electrochemicals wing contains equipment for duplicating customer operations in peroxygen, vinyl and related product fields.

The pigments laboratory has facilities for developing tailor-made pigments for the paint, plastics and other industries.

An important laboratory function will be to develop pigment formulations for customer use. This includes evaluation as to stability in storage, ease of application, appearance and durability. For paint manufacturing customers, new vehicle systems will be tested constantly to determine the effect on pigment formulations.

Du Pont's electrochemicals department manufactures "Elvacet" polyvinyl acetate emulsions used in making quick-drying, odorless water-base paints. Technician is running a PVA formulation through a Morehouse mill to reduce pigment particles.

Paint test preparations at Du Pont's new laboratory. Technician is shown applying a measured amount of paint to each panel. Here, asbestos shingle is being used. Wood siding and masonry samples are also prepared for outdoor exposure tests.

NEWS

Cyanamid Builds Maleic and Anthraquinone Units

The American Cyanamid Co. will build two multi-million dollar units in the near future.

The company will construct an anthraquinone manufacturing facility at its Bound Brook, N. J. plant, using a completely new process developed in the research laboratories.

The new unit will be operated by Cyanamid's organic chemicals division.

The plant, which will replace and expand existing anthraquinone facilities, will also provide additional production capacity for making methyl anthraquinone, napthoquinone and phthalic anhydride.

The plant is expected to be completed late in 1959.

Cyanamid will also commence construction this summer on a maleic anhydride manufacturing plant at Bridgeville, Pa.

The new unit will cover approximately two acres of land adjacent to the company's present production facilities at Bridgeville.

Initial production capacity is scheduled for 14,000,000 pounds annually. The plant is expected to be ready for operation late next year.

The maleic anhydride unit will be incorporated into the operations of the plastics and resins division of the firm.

•

Hollis Gives Club Talk

Sam Hollis, Pennsylvania Industrial Chemical Corp., was the guest speaker at the May meeting of the Philadelphia Paint & Varnish Production Club.

Mr. Hollis discussed the subject of "Hydrocarbon Resins." He outlined the properties, applications and advantages of these resins. In addition, he pointed out that hydrocarbon resins are not given the attention that is due them because of their special properties since many people think of them only as low cost materials to be used to lower the price of paint products.

Harold Gough, chairman of the technical committee, reported that a paper was in progress by the committee doing work on oil absorbtion.

•

Sales Agent Appointed

The mining and mineral products division of Great Lakes Carbon Corp. has become the sales agent in the United States and Canada for clay, pyrophyllite and other products of Huntley Industrial Minerals, Inc.

The Great Lakes division is headquartered in Los Angeles.

SILANEAL TREATED BRICKS: As cured bricks are conveyed from the tunnel kilns at Reliance Clay Products, Dallas, they are sprayed with a solution of Silaneal 772. Silaneal treatment, developed by the Dow Corning Corp., is said to insure longer-lasting attractive appearance, despite all weather conditions.

Thies to Receive Degree

Herman R. Thies, general manager of the Goodyear Tire & Rubber Company's chemical division, will receive an honorary doctor of science degree from Phillips University.

During his career with Goodyear, Thies has made many valuable contributions to chemistry, has been assigned a number of patents and has written scientific papers for publication.

•

A. J. Luther Retires

A. J. (Carl) Luther, director of sales training for Archer-Daniels-Midland Co. and prominent figure in national sales and promotion fields, retired on July 1, it has been announced.

During his 18 years with ADM, Mr. Luther headed the company's feed sales promotion department from 1944-48 and during the next five years, managed the packaged linseed oil department. In 1953, he became director of sales training.

Mr. Luther is an international committee chairman for the National Sales Executives and a speaker at their national congress.

He was elected to membership in the National Society of Sales Training Executives, an organization limited to 100 members nationally.

GLOSS RETENTION TEST: A paint-gloss test is watched by A. P. Pahl, director of research for W. P. Fuller & Co. Conducting the tests are, from left, paint chemists A. Zanardi and E. Kevin. Placed on the market this month, the new paint has exceptional high color and gloss retention.

NEWS

Standards Engineers Schedule Meeting

The seventh annual meeting of the Standards Engineers Society will be held at the Benjamin Franklin Hotel, Philadelphia, on September 22, 23 and 24. The theme of the meeting will be, "Standardization—A Must for the Space Age."

To stimulate new ideas and to develop a top-quality program, the annual meeting committee is sponsoring a technical paper contest in conjunction with the meeting. An award of $50 will be presented to the author of the winning paper and it will be published in *Standards Engineering*, the official publication of SES.

Rules of the contest, open to anyone, are as follows: Papers must be concerned with some aspect of standardization, and should preferably be related to the theme of the meeting; papers should be 1600-2400 words in length; and papers must be typed on one side of 8½" x 11" paper, double spaced, submitted in quadruplicate and postmarked not later than August 1. They should be sent to Mr. E. D. Clark, Vice Chairman, SES 7th Annual Meeting, Dept. PVP c/o Standard Pressed Steel Co., Jenkintown, Pa

•

Morningstar-Paisley Expands

Earl C. Lenz, sales vice president of Morningstar-Paisley, Inc., has announced that his firm is planning an expansion of its latex and plastisol sales and technical departments.

The first stage of the program has started with an expansion of the plastisol and latex sales and laboratory facilities, plus additional pilot plant equipment at the New York City location, to be followed by installation of large processing equipment, adjoining the firm's Haberland plant, at Clifton, N. J.

Completion of the new facilities is expected by August, 1958.

NEW TECHNICAL CENTER: Located at the company's headquarters in Wilmington, Del., this new $3,000,000 facility will provide quarters for Atlas Powder Company's expanded program of basic research and product development.

Water Terminal Planned

A one million dollar deep water terminal on the ship channel at Mobile, Ala. will be built by Reichhold Chemicals, Inc., it has been announced.

The terminal will have a capacity of several million gallons of liquids as well as being capable of extensive bulk handling of dry chemicals.

Described as an important link in the chemical company's worldwide operation, the terminal will include extensive space for drumming and storage of finished products.

In addition to all forms of water transportation, shipments can be made from the terminal by railroad or truck.

•

Pittsburgh Coke Expands

The industrial chemicals division of Pittsburgh Coke & Chemical Co. has expanded its plasticizer production capacity by 50%, it has been announced.

The added capacity, now on stream, follows the company's recent 100% increase in phthalic anhydride capacity.

•

Rassweiler Awarded Degree

Dr. Clifford J. Rassweiler, vice president for research and development of the Johns-Manville Corp., has been awarded the honorary degree of Doctor of Science by the Polytechnic Institute of Brooklyn.

Dr. Rassweiler joined Johns-Manville in 1941 after 17 years with the Du Pont organization. He was appointed vice president for research in 1942 and was made a member of the board of directors in 1951.

He received his Ph.D from the University of Illinois.

•

Resin Plant at Calvert City

Plans to build a new chemical plant and an extensive pilot plant facility costing in excess of $12,000,000 were disclosed by Air Reduction Co., Inc.

The plant, which will be constructed at Calvert City, Ky., will produce 20 million pounds per year of polyvinyl alcohol resin. The project will include an expansion doubling the capacity of the existing 45 million pounds per year vinyl acetate monomer plant.

Construction is expected to be completed by early 1960.

•

Filteraid Plant in Mexico

Opening of the first filteraid plant in Mexico has been announced by the mining and mineral products division of Great Lakes Carbon Corp., producer of Dicalite filteraids.

The corporation's new 6,000-ton per-year plant in Mexico City is now producing a new type of filteraid made from perlite, a siliceous lava rock. It will be marketed under the brand name Dicalite "Dimesa."

NEWS

Cyanamid Presents Papers At Vehicle Group Meeting

The American Cyanamid Co. presented papers at the New York Paint, Varnish & Lacquer Assn., Vehicle Manufacturers Group, meeting held on May 14.

The first paper outlined Cyzac resins, Cyanamid's latest series of vehicles for industrial baking enamels.

These resins are solutions in a mixed butanol-xylol solvent of resin compositions which are heat convertible in the presence of catalyst. When properly catalyzed, their behavior is comparable to that of melamine resin-alkyd resin combinations, but the rate of cure is generally much faster and the cured enamels are said to have many additional desirable features.

Three Cyzac formulations are presently available: Cyzac resins 1006, 1007 and 1013. Cyzac resin 1006 is expressly formulated for color stability whereas Cyzac 1007 has more general purpose utility. Cyzac 1013 is a novel formulation for roller coat enamels.

One of the most characteristic features of Cyzac resin enamels is outstanding sharp, clear gloss. Another distinctive feature is the high combination of impact resistance and flexibility with hardness. Other properties include excellent stability, color and color retention.

Overall readings for gloss retention, chalking, dirt collection and film integrity show the Cyzac enamel to be at least as good and possibly somewhat better than the melamine.

The second paper was concerned with a new vehicle for trade sales finishes—Cyaqua alkyd resin emulsion.

The following are the basic properties of Cyaqua, an emulsion of an alkyd resin: Infinitely water-dilutible, stable to shock and freeze-thaw, non-corrosive to containers or metal substrates, slight and not unpleasant odor, excellent pigment wetting power, and characteristic alkyd dispersing and grinding properties.

PAST PRESIDENTS: Fourteen former presidents of the Cleveland Paint & Varnish Production Club were at the May meeting held at the Case Institute. From left to right, 1st row: G. H. Mutersbaugh, 1940-41; F. H. Kamin, 1919-20; J. P. Wagner, 1923-24; and H. G. Whitcomb, 1936-37. 2nd row: J. C. Caldwell, 1937-38; H. J. L. Cotton, 1939-40; G. B. Sawyer, 1924-25; J. M. Rumberg, 1928-29; S. Huey, 1949-50; and G. T. Sohl, 1925-26. 3rd row: E. H. Ott, 1947-48; W. M. Tome, 1953-54; M. W. Malaga, 1956-57; and E. Schulte, 1938-39.

Although Cyanamid had done no more than exploratory work, Cyaqua alkyd emulsion is compatible with most high polymer latices and should be of value in improving their film forming properties. Used in relatively small amounts, it can, to some extent, replace conventional coalescing agents, thereby promoting continuity without adverse effect on water resistance.

•

Fuller Establishes Division

W. P. Fuller & Co., as part of the company's develpment in the west, has established the Nason Products Division.

The new division will bring into the parent organization the activities formerly conducted by R. N. Nason & Co., a wholly-owned subsidiary of Fuller since 1928.

Under the new organization plan, Nason customers will have direct service from the full distributing, warehousing, manufacturing and research facilities of Fuller.

•

Columbian Carbon Expands

Enlarged Facilities for Columbian Carbon Company's research will be provided by the end of 1958 in the company's new million-dollar research headquarters now being built near Princeton, N. J.

Facilities will cover present and expected needs in all phases of research and development on carbon black, pigments and related fields.

The new research headquarters will comprise two one-story buildings with combined total floor space of 30,000 square feet.

•

Push-Button Paints

The American Can Co., manufacturer of pressure cans for many products, reports that the paint industry is having a 50-million can year for aerosol paints. By comparison, production last year amounted to 35-million cans. In 1956 it was 22.5-million and in 1955, only nine-million.

Today about 25 leading paint manufacturers are turning out spray paints.

Also playing a role in the growth of pressure-packed paints is the fact that they are now being stocked as regular items in most paint stores.

•

Willets Awarded Gold Watch

William R. Willets, assistant manager of National Lead Company's titanium division technical service laboratories in New York City, has been awarded a gold watch in recognition of twenty-five years of service with the firm.

Mr. Willets is in charge of the paper section of the laboratories, a position he has held since joining the company in 1933.

VELSICOL W-617

Hydrocarbon Resin Emulsion

helps more people use emulsion paint more often!

NEW! W-617 EXPANDS YOUR SALES POTENTIAL!

Women like to redecorate. But they don't like to compromise with quality. And there's always the budget to consider. With Velsicol W-617, you can remove the quality and budget limitations on your market, and sell more emulsion paints. W-617 maintains high standards of scrubbability, flexibility, and freeze-thaw, but cuts raw materials costs way down!

NEW! W-617 MEANS BIG RAW MATERIALS ECONOMIES!

W-617 is a low cost water dispersed film former. W-617's low cost makes it ideal for use as the sole film former in the production of white and pastel shade flat paints. Used with styrene butadiene or acrylic latices, it maintains quality while drastically reducing cost. Used in place of alkyd resins, as a modifying agent, it provides greater scrub resistance at lower cost. Raw materials savings become overall production savings, too, because W-617 is versatile and easy to use in emulsion paint formulations.

NOW AVAILABLE IN COMMERCIAL QUANTITIES! FOR TECHNICAL INFORMATION AND TEST SAMPLES, MAIL THIS COUPON TODAY!

LOOK FOR THIS MAN

. . . your Velsicol representative, who can help you make better products for less!

VELSICOL
CHEMICAL CORPORATION
330 E. GRAND AVE., CHICAGO 11, ILL.

International Representative: Velsicol International Corporation, C.A. • P. O. Box 1687 • Nassau, Bahamas, B.W.I.

MAIL THIS COUPON TODAY!

VELSICOL CHEMICAL CORPORATION
330 East Grand Avenue, Chicago 11, Illinois

- ☐ Please send a sample of W-617 for pilot plant use.
- ☐ Please have a salesman call.
- ☐ Please send technical literature.

PV78

Name_____

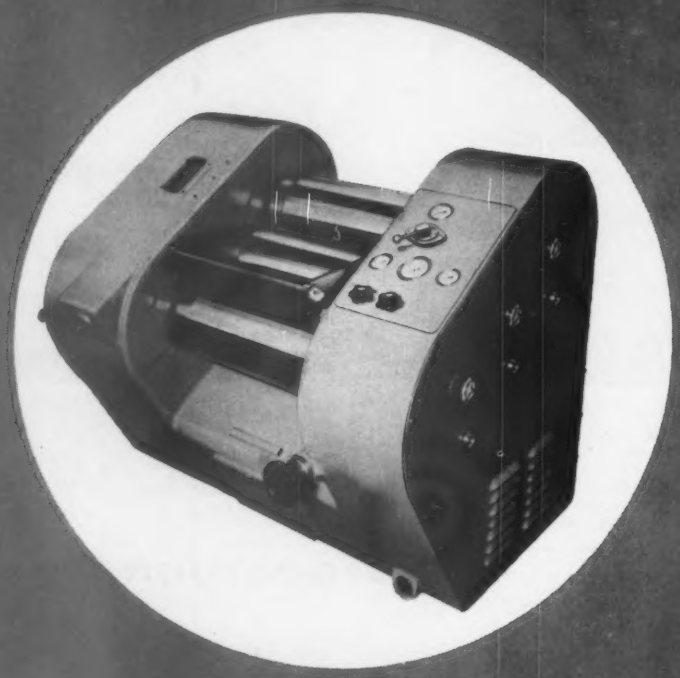
Company_____

Address_____

City_____ Zone____ State_____

New fully hydraulic

BUHLER 3-Roll Mill



SDA
Roll Dimensions: 10" x 20"

SDT
Roll Dimensions: 16" x 32"
16" x 40"

• Up to 60% higher output

• Absolutely even pressures for uniformly fine grinding

1. New hydraulic regulating system provides absolute pressure stability and easiest (1 second) setting of rolls.
2. Determines exact pressure for any formula and duplicates it for that formula at any time.
3. Rolls disengage for cleaning in *1 second.* A simple hand-lever shift disengages rolls and scraper blade instantly. By shifting hand-lever back to operating position, rolls and scraper blade are restored to the exact pressure they were set at before disengaging.
4. New feed hopper arrangement increases working surface. Hopper cheeks do not rest on the roll, but are hydraulically pressed to the shoulder of the roll; permit grinding across the whole length of the roll, with even wear.
5. Hydraulically operated scraper blade maintains selected pressure irrespective of wear. Never loses pressure — hydraulic control takes up automatically to maintain exact selected pressure with wear.
6. Can be furnished with variable speed drive for the first roll, or driven by a 2- or 3-speed motor. Regulating the speed of the first roll for paints and inks of different consistencies increases the capacity 60% and more.

BUHLER BROTHERS, INC. (U.S.A.)
130 COOLIDGE AVENUE, ENGLEWOOD, NEW JERSEY
SALES REPRESENTATIVES: Hans Zagg, Los Altos, Cal.
Arthur Kunz, New Orleans, La.

BUHLER BROTHERS, (CANADA) **LTD.**
24 KING STREET WEST
TORONTO 1, ONTARIO

DEWEY & ALMY FORMULA

70 pounds of Celite 281 are contained in every 100 gallons of Dewey & Almy's vinyl acetate copolymer exterior paint formulation 84600. For full details, write for formulation 84600 to Dewey & Almy Chemical Company, Division of W. R. Grace & Co., Cambridge 40, Massachusetts.

On masonry surfaces, I have to be sure the paint won't chalk or blister.

He can be sure with Dewey & Almy's Formula 84600 using Celite diatomite

The micro-porosity of Celite* helps to increase moisture-vapor permeability and prevents blistering and peeling. The unique structure of Celite particles provides extra weather-resistance and helps prevent excessive chalking. The irregular shapes of the particles also promote better adhesion.

Find out how Celite can help prevent blistering and enhance film integrity in exterior paint. Write for further information to Johns-Manville, Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.

After nearly four years of severe exposure conditions on this building, Dewey & Almy's vinyl acetate copolymer paint containing Celite shows outstanding film integrity . . . is chalk-free, mold-free, remarkably fresh and clean.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products

Johns-Manville CELITE Diatomite Pigments

From the **HIGHEST** to the **LOWEST**

OTHER GRADES OF AZO ZINC OXIDES IN A WIDE RANGE OF OIL ABSORPTIONS

Where necessary to meet your requirements we can select within grades the *exact* degree of desired oil absorption.

NOTE: AZO paint grade zinc oxides available as AZODOX (de-aerated). AZODOX has twice the apparent density, half the dry bulk of conventional oxides.

1ST

American Zinc was the first, *and is still the only* producer of acicular lead-free zinc oxides covering a wide range of oil absorptions from high to low *and including the intermediate ranges.*

For Example:

When high consistency is wanted, use . . .

AZO ZZZ-22

This is the original high oil absorption acicular zinc oxide. The unusual weathering properties imparted to paints by AZO acicular type zinc oxides are present to the highest degree in AZO ZZZ-22.

When very low consistency is wanted, use . . .

AZO ZZZ-55 or AZO ZZZ-55-LO

Highly recommended for general paint formulations where very low oil absorption zinc oxide is desired. Absence of colloidal fines assures good weathering characteristics. Round particle shape.

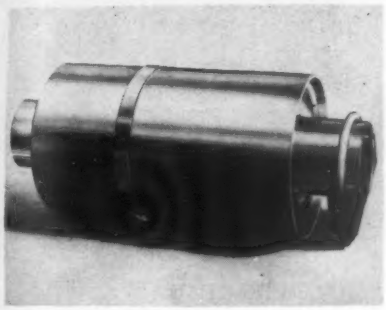
American Zinc sales company

Distributors for AMERICAN ZINC, LEAD & SMELTING COMPANY
COLUMBUS, OHIO • CHICAGO • ST. LOUIS • NEW YORK

NEW MATERIALS & EQUIPMENT

A MONTHLY MARKET SURVEY

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.



ERICKSON

SPARK ARRESTOR

Cyclonic Action

Compact spark arrestor that approximates the size and shape of a muffler is now ready for forklifts, pickups and loaders.

New type of gill spark arrestor uses straight-through exhaust-flow principle and cyclonic action that is said to be almost 100% efficient in trapping dangerous incandescent exhaust carbon.

Highly efficient at all throttle ranges. Back-pressure claimed to be very low. Having both inlet and outlet fittings, it can be placed at the end of, or within the exhaust system, and mounted at any angle.

Arrestor can, in most operations, replace the muffler. Available to accommodate both gas and diesel engines up to 325 cubic inch displacement.

Erickson Products Co., Dept. PVP, 1960 Carroll Ave., San Francisco 24, Calif.

MERCADIUM COLORS

New Series Available

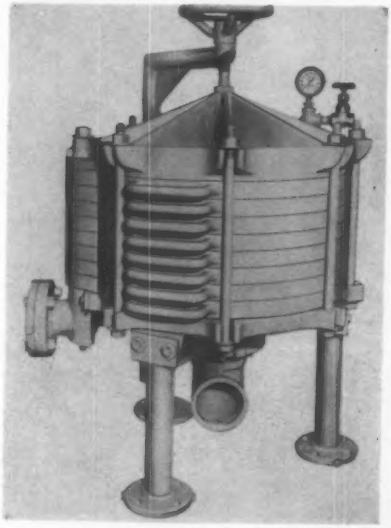
A new series of less reactive Mercadium colors now offered. Colors range from deep orange GP to maroon GP.

Gives excellent compatibility in all vehicle types. Has good dispersion properties and extremely soft texture.

Another new series available designed for use where high tinctorial value at a lower level of pigment loading is desirable. Colors range from light red conc. to dark red conc. Possesses previously mentioned properties.

Both series said to offer clean, brilliant hues, excellent chemical and solvent resistance, and good heat resistance.

Imperial Paper & Color Corp., Pigment Color Division, Dept. PVP, Glens Falls, N. Y.



SPARKLER

PLATE FILTER

Horizontal & Tankless

Low-cost tankless horizontal plate filter called model TL.

Design eliminates the necessity of a tank by having filter plates serve as a filter unit within themselves.

Several measures have been taken to eliminate leakage. Requires minimum amount of floor space and available in capacities up to 396 sq. ft. of filtering area.

No unfiltered heel at end of cycle and filter cake can be blown by means of gas or air pressure. Standard operating pressures are 150 lbs.

Sparkler Manufacturing Co., Dept. PVP, Mundelein, Ill.

DEAMIDATED ZEIN

Dispersed in Water

Zein G210 does not require strong alkali or organic solvents to disperse it in water.

This new Zein produces hard, tough, grease resistant films that are non-thermoplastic. It can be used to formulate rubless floor polishes and other products.

Compatible in all proportions with shellac, bleached or bleached dewaxed, and with phenolic modified rosin esters.

Corn Products Sales Co., Dept. PVP, 17 Battery Place, New York 4, N. Y.

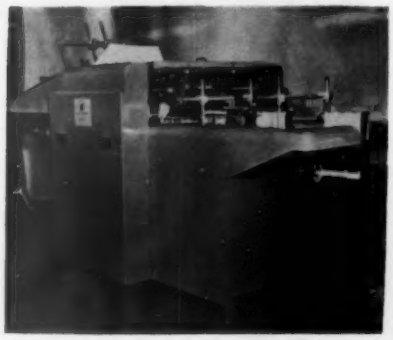
PACKAGING MACHINE

Compact and Flexible

Jak-Et-Pak-50, compact and flexible multiple packaging machine designed for broad application of wrap-around multi-unit cartoning at a low cost.

Has dimension of 10′4″ in length by 4′2″ in width. Machine has a wide packaging size range.

Presents wide possibilities for automatic multiple unit packaging.



CONTINENTAL CAN

Changeover from double line to single line packaging easily accomplished.

NEW MATERIALS — EQUIPMENT

Double action lock provides easy opening device. Locking mechanism contains no moving parts.

Boxboard & Folding Carton Division, Continental Can Co., Dept. PVP, 530 Fifth Ave., New York 36, N. Y.

PVAc EMULSION
For Aluminum Paints

Flexbond Exp. F-136 now makes possible the formulation of new type of aluminum paint, a water-based emulsion free of flammable solvents.

Flexbond F-136 is a polyvinyl acetate copolymer emulsion. When formulated, it will not bleed over asphaltic surfaces and has good adhesion over variety of substrates, including galvanized iron.

Colton Chemical Co. Division of Air Reduction Co. Inc., Dept. PVP, 1747 Chester Ave., Cleveland 14, Ohio.

GEAR DRIVE
Up to 4,000 Gallon Vessel

Low maintenance gear drive with a solidly silent operation. Intended for use on 300 gallon through 4,000 gallon agitated vessels.

The unit, designated the B H Drive, offers various design advances. These are pilot fit, interchangeable seal or stuffing box, wide bearing span, hardened and lapped spiral bevel gears, five leak proof oil seals, and new "T" head draw bar design.

The B H Drive is currently rated at 12, 30 and 60 hp units at 100 r.p.m.

The Pfaudler Co., Dept. PVP, 1065 West Ave., Rochester, N. Y.

FEIN'S

"SHELF-LIFE" PAIL
Reduces Skinning Condition

Two-gallon "Shelf-Life" 8 lug cover pail, designed to reduce skinning condition prevalently found in packaging alkyd, odorless, and shelf-life paints.

Pail claimed to increase the resistance to skinning of alkyd, odorless and other paints prone to skinning by at least 300%.

Fein's Tin Can Co., Inc., Dept. PVP, 50th Street & First Ave., Brooklyn, N. Y.

PAINT TUBE SQUEEZER
No Waste or Smearing

Compact machine for discharging full contents of paint tubes without waste or smearing and suitable for convenient on-the-counter or workbench installation.

Called "Paint Tube Squeezer," model PTS1, lightweight unit said to completely eliminate "pale" tints by providing a full charge of even the stiffest pigments into the liquid vehicle. Work area requires a depth of 26½".

Squeezing cannot begin until manually-controlled handle is set in motion.

Instantly adjustable height column to avoid splatter also available.

Red Devil Tools, Dept. PVP, Union, N. J.

NEW MATERIALS — EQUIPMENT

PUCEL

DRUM LIFTER
One-Man Operation

Grizzly No. 235 Drum Lifter lifts vertically. Has 2,000 lb. capacity—attached and removed in seconds, used with fork trucks, chain falls, cranes and hoists. Moves 55 and 30 gallon and even smaller drums.

Tiers and handles drums in and out of close quarters. Weighs 26 lbs.

Pucel Enterprises, Inc., Dept. PVP, 3746 Kelley Ave., Cleveland 14, Ohio.

REODORANT CHEMICAL
For Odor Control

The strong odors of paint solvents can be controlled with the addition of Alamask DS.

Alamask DS is a new addition to the family of Alamask chemicals which have been found to abate abnoxious odors from many natural and synthetic substances.

Alamask DS does not leave a residual odor of its own. In hydrocarbon solvents, concentrations of only 0.001% to 0.01% by weight are normally needed to nullify offensive odors.

Rhodia, Inc., Dept. PVP, 60 East 56th St., New York 22, N. Y.

SURFACTANTS
Non-Ionic

Series of non-ionic surfactants derived from castor oil. In these "Surfactol" products, castor oil has been modified by ethoxylation to four different stages so that in hydrophilic properties the products range from moderately self-emulsifiable to completely soluble in water.

Major applications include emulsifiers, emulsion paints, and solubilizers for dyes and oil extracts.

Possess defoaming properties and have very mild wetting action.

The Baker Castor Oil Co., Dept. PVP, 40 Avenue A, Bayonne, N. J.

EPOXY CO-REACTANTS
For 100% Coatings

Two new liquid co-reactants for epoxy resins, trade-named Genamid 250 and Genamid 310.

Particularly suitable in the field of 100% solids coatings.

Key properties are low viscosity and fast cure. Genamid 250 is more fluid and cures more rapidly than the 310.

Expected to find wide usage in coatings, castings and adhesives.

Chemical Division, General Mills, Dept. PVP, Kankakee, Ill.

CALCIUM CARBONATE
For Flat Wall Paints

A low-cost grade of dense-type precipitated calcium carbonate called "Carbium."

As an extender for flat wall paints, "Carbium" said to provide uniform flattening at high pigment volume. It gives reduced streak-

Hercules Research Reveals

PE ALKYDS MADE WITH PELARGONIC ... IMPROVE METAL FINISHES

Hercules Powder Company, a leading supplier of pentaerythritol for the protective coatings industry, recently completed a comprehensive study of alkyd-amine automotive and appliance finishes.

Hercules laboratory results show conclusively that PE alkyds made with Emfac 1202 Pelargonic Acid as the fatty acid modifier have definite advantages. Primary improvements include better color, color stability, gloss, and gloss retention. Other advantages are hardness, resistance to dirt pick-up, and alkali resistance.

Since Emfac 1202 Pelargonic acid is competitive in price with other fatty acid modifiers, your PE alkyds can have these superior properties with no increase in cost. Begin your evaluation of PE-pelargonic alkyds today. Trial samples of Emfac 1202 are available on request.

Emery ORGANIC CHEMICAL SALES DEPARTMENT

Emery Industries, Inc., Dept. X-7 Carew Tower, Cincinnati 2, Ohio

West Coast: Vopcolene Div., 5568 E. 61st Street, Los Angeles, Calif.
Export: Carew Tower, Cincinnati 2, Ohio

ing, flashing or ghosting of medium shades and deep tones.

Other advantages claimed in its use as a paint filler include partial dry hiding without sacrificing color uniformity, relatively good grindability with low abrasion, and low polishing when rubbed.

Diamond Alkali Co., Silicate-Detergent-Calcium Division, Dept. PVP, 300 Union Commerce Building, Cleveland 14, Ohio.

COUNTER-ROTATING PUMP
For "Problem" Materials

Counter-rotating pump designed to handle "problem" materials.

It handles chemical slurries, sand and water and viscous materials in a wide range of densities, with solid particles in suspension, at very low and very high temperatures and, at high flow rates and pressures, without separation of the mixtures.

Pump operates by the method of counter-rotation supplied by two small diameter impellers. These axial impellers, counter rotating at relatively high velocities, allow the free passage of coarse and viscous materials.

Pump is of simple design with open clearance throughout. No sealing or wearing rings are required.

Baez Counter-Rotating Pump Corp., Dept. PVP, Six Manhasset Ave., Port Washington, L.I., New York.

For satisfaction and savings

STANDARDIZE ON

NOPCO PAINT ADDITIVES

The paint manufacturer who looks to Nopco as the source for all his additives benefits in more ways than one. Because Nopco manufactures a complete line of additives he can place a single order to cover all his needs—enjoy the convenience of a single shipment and benefit from quantity discounts. Because Nopco plants and warehouses are strategically located, he can count on fast deliveries and substantial savings in freight. And because of the resources in experience, facilities and personnel back of the Nopco paint chemicals line, he can be sure of technical service of the highest competence.

If you are not already a Nopco customer you will find it to your advantage to become one.

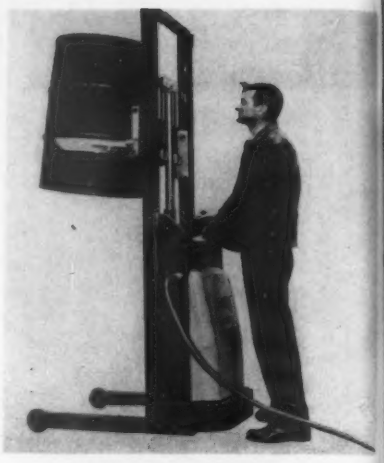
NOPCO PAINT SPECIALTIES INCLUDE

- *Anti-Foaming Agents*
- *Pigment Dispersing Agents*
- *Freeze-Thaw Stabilizers*
- *Thickeners*
- *Viscosity Stabilizers*
- *Surface Active Agents*
- *Metallic Soaps*

Write for a booklet fully describing the Nopco line. Nopco Chemical Company, Harrison, N.J., or Richmond, Calif.

NOPCO VITAL INGREDIENTS FOR VITAL INDUSTRIES

Harrison, N.J. • Richmond, Calif. • Cedartown, Ga. • Boston, Mass. • Chicago, Ill. • London, Canada



AMERICAN PULLEY

AIR-POWERED HAND TRUCK
For Use in Hazardous Areas

Air-powered portable elevating truck designed for use in hazardous locations where maximum protection against fire or explosion causing sparks is required.

Available in all models, air-powered unit permits powered load-lifting in such areas as refineries, gasoline storage areas and small garages.

Quick disconnect couplings said to permit convenient, easy attachment to any air line in the plant.

Designed to handle loads up to 1500 lbs. Trucks have exceptional versatility.

The American Pulley Co., Dept. PVP, Philadelphia, Pa.

RED PIGMENTS
Lightfast & Durable

New family of red pigments giving durable red shades for automobile finishes, paints and other products.

Said to combine excellent lightfastness, brilliance, bleed resistance, chemical inertness, heat stability, working properties and a desirable color range. Because of the intensity of "Monastral" reds, strong colors can be produced, even when let down with white or used in metallic or polychromatic finishes.

Tests of water emulsion house paints show excellent lightfastness of "Monastral" reds, particularly in pastel shades.

E. I. du Pont de Nemours & Co., Inc., Dept. PVP, Wilmington 98, Del.

NEW MATERIALS — EQUIPMENT

AMERICAN CAN

PAINT CAN
Solderless Clinched Ears

One-gallon paint can with solderless clinched ears developed.

Clinched ear construction method said to provide excellent accident-proof handling.

Simplified drawing illustrates method of attaching the ears by "bumping" a can body fold over the ear flange.

American Can Co., Dept. PVP, 100 Park Ave., New York, N. Y.

CONVEYOR ROLLER
For Package and Carton Handling

Lightweight conveyor roller for package and carton handling.

Economical #138 roller features "spring-o-matic" axle construction which is said to permit quick, easy insertion or removal of the roller from the frame.

For positioning roller in conveyor frame, shaft end is manually depressed; spring loaded, it snaps into the axle hole of the frame, ready for immediate operation.

Conveyor sections available in 12″ and 18″ widths from stock and other widths from 6″ to 30″ on special order. Roller itself, which turns on integral ball bearing, is 1-3/8″ in diameter, with 18 gauge steel wall, and is rated at 80 lbs. capacity.

Roller spacing for #138 available in multiples of 1½″. Rollers available for use with both straight and curved conveyor sections.

E. W. Buschman Co., Dept. PVP, Clifton and Spring Grove Avenues, Cincinnati 32, Ohio.

DITHIOL
Cross-Linking Agent

Inexpensive dithiol, glycol demercaptoacetate has been introduced.

Can act as a cross-linking agent and monomer for special polymerizations by addition across ethylenic unsaturation, and by reaction with active halogen.

Evans Chemetics, Inc., Dept. PVP, 250 E. 43rd St., New York, N. Y.

DRUM AGITATOR
For Hazardous Atmospheres

New line of air-driven drum agitators, said to be completely safe, now available.

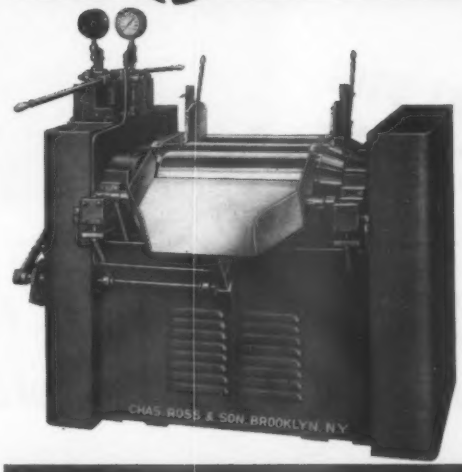
Designed for use in hazardous atmospheres where explosive mixtures are used.

Units are portable and can be used on standard 55-gallon drums when agitation of explosive liquids prohibit use of electrical equipment. Can be operated off most existing compressed air systems.

Two motor sizes available to meet wide range of mixing requirements. Mixing speeds vary from 500 to 2000 rpm, depending on air pressure.

Prenco Products Inc., Dept. PVP, 507 East 10 Mile Road, Hazel Park, Mich.

NEW Ross ONE POINT HIGH SPEED THREE ROLL MILLS WITH — HYDRAULIC ROLL ADJUSTMENT

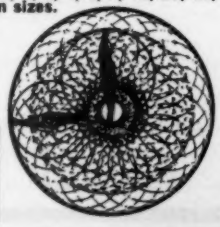


1. Pressure indicating gauges provide greater ease in properly setting rolls, and less skill or experience is required by operator.
2. Roll pressure settings can be recorded for exact reproduction of material assuring standardization of product.
3. Special equalizers assure positive parallelism of roll faces at all times for uniform dispersions and minimum maintenance costs.
4. Mills have quick roll release with safety overload feature, and are convertible for either fixed or floating center roll operation. 2½x5, 4½x10, 6x14, 9x24, 12x30, 14x32, and 16x40" sizes.

PRODUCTION SIZE DISPERSION TYPE CHANGE-CAN MIXER WITH — DOUBLE PLANETARY STIRRER ACTION

- Stirrers with special blade angles and very close clearances revolve on their own axis and also around can developing 12 intense compressive and shearing actions with each revolution to break down and disperse agglomerates.
- Variable speed for infinite range of stirrer speed control.
- Simplified vertical hydraulic lift for greatest ease in cleaning down stirrers.
- Non-revolving can is completely enclosed during mixing for safety and to reduce solvent loss. Cans can be jacketed or fitted with slide gate when required. Cans are easily positioned or removed from Mixer.
- Extra heavy construction and standard type motor eliminate costly downtime. Oversized motor drives can be provided for kneading and mixing extremely heavy materials. 1, 2, 3, 4, 6, 8, 12, 25, 50, 65, 85, 125 and 150 gallon sizes.

Area of can contacted by stirrers during only one revolution of stirrers around can (2 seconds). Position of stirrers advances 4½° with each successive revolution to sweep entire area and all points on sides of can. Stirrers overlap each other as well as center of can.



Write for further information!

CHARLES ROSS & SON CO., INC.
ESTABLISHED 1869
148 CLASSON AVE. BROOKLYN 5, N. Y.

NEW!

LEAKPROOF

LESS STORAGE SPACE

MANY USES

DAVIES 5 Gallon Flaring Pail

features a single, welded seam

LEAKPROOF — Unlike the conventional dope side double seam container, the Davies flaring pail has only *one* seam and it's *welded.* Thus you are assured leakproof protection and greater strength.

LESS STORAGE SPACE — Flaring pails require much less storage space than straight side containers. The tapered design of the new Davies flaring pail permits storing at least three times as many pails in a car or in your factory.

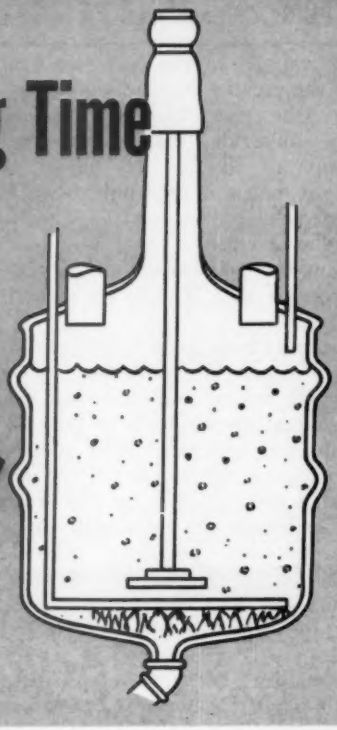
MANY USES — Now widely used as a container for roofing and caulking compounds, the welded construction feature of the Davies flaring pail offers many new applications.

Available plain or lithographed, this pail is only one of many containers produced at Davies' three plants in Cleveland, Conneaut and Massillon, Ohio. Combined they offer you 96 years container experience for safe and sure product protection.

THE DAVIES CAN CO. 8007 Grand Avenue • Cleveland 4, Ohio

CO_2 Sparging Cuts Cooking Time by 485 Minutes

PERFECT RESULTS in 1/3 the time



Actual tests conducted in the laboratories of a major manufacturer (name on request) produced these conclusive findings:

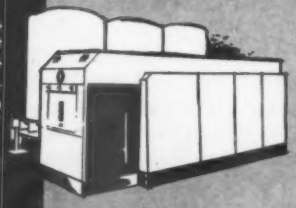
CO_2 sparging, added to conventional mechanical agitation, cuts cooking time from 720 to 235 minutes! To achieve this remarkable saving, CO_2 functioned in 3 important ways—

1. Sparged up through the mixture, CO_2 markedly increased agitation, causing faster, more even cooking.
2. Passing up through the mixture, the CO_2 bubbles absorbed water vapor from the product—allowing the mixture to reach the desired cooking temperature sooner.
3. CO_2, when sparged through the reaction mixture, inerts it—effectively inhibits oxidation—color stays desirably light and constant.

Here are some of the many ways in which CO_2 is helping to do a better job and lower costs.

- Cuts oil cooking time 2/3
- Retards oxidation in thinning tanks and provides fireproof blanket
- Prevents "skinning" in storage
- Safest transfer medium for flammable fluids
- Purges filters, recovers oil, reduces cleaning time and frequency of cleanings
- Prevents flash fires, explosions. CO_2 provides a heavier-than-air "blanket" that displaces oxygen
- Prevents "skinning" and eliminates costly cleanouts of transport containers

LIQUIFLOW CO_2 SYSTEM



Manufactured by Liquid Carbonic. This unit assures a constant supply of chemically pure CO_2 anywhere in your plant. Let experienced LIQUID engineers show you how an integrated Liquiflow CO_2 System will improve your product and lower your operating costs.

World's Largest Producer of

LIQUID CARBONIC

DIVISION OF GENERAL DYNAMICS CORPORATION
Chicago 23, Illinois

FREE BULLETIN

Gives complete details on CO_2 applications in the paint and varnish industry. Send for your copy of "The Use of CO_2 in Paint, Varnish and other Alkyd-Type Resin Manufacturing."

LIQUID CARBONIC
DIVISION OF GENERAL DYNAMICS CORPORATION
3128 South Kedzie Avenue • Chicago 23, Illinois

Please send me your technical bulletin on the uses of CO_2 in the paint and varnish industry.

Name_____

Title_____

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PETROCHEMICALS (*From page 36*)

increased rapidly in the past two years, largely because of the greater demands made on maleic anhydride by the protective coatings industry. Like phthalic anhydride, maleic may be used in the preparation of alkyds. Its higher price, however, means that maleic is used only when the advantages that it provides are necessary. These advantages include higher viscosity. Maleic anhydride is also important in the preparation of polyesters, which are copolymerized with styrene for structural as well as coating uses.

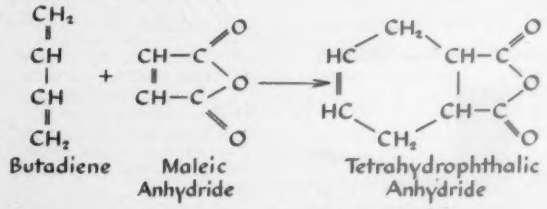
Maleic anhydride finds application also in the production of improved drying oils. When heated with a drying oil, maleic anhydride will copolymerize by one of several mechanisms to provide an oil which dries faster and provides harder, more resistant films.

Approximately 60 per cent of the maleic anhydride produced is used directly by the protective coatings industry, whereas the remaining 40 per cent is distributed between polyester plastics, agricultural chemicals, paper sizing, pharmaceuticals, wetting agents and adhesives.

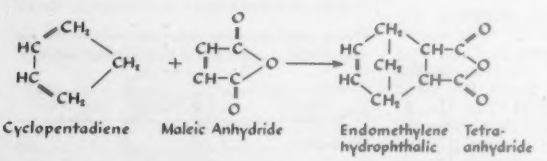
It is interesting to note that a small amount of maleic anhydride is obtained as a by-product during the manufacture of phthalic anhydride. The bulk of maleic anhydride by far, however, comes from the direct oxidation of benzene. Benzene, like naphthalene, is originally obtained exclusively from the coking industries. As the need for benzene increased, however, the petroleum-based product has become more important until, in 1955, approximately 35 per cent of all the benzene produced was obtained from the petrochemicals industry.

The oxidation of benzene to produce maleic anhydride proceeds with air in the presence of vanadium pentoxide on an alumina carrier. Temperature of reaction ranges from 400 to 500°C.

A variety of other dibasic acids has been proposed for alkyd formulation. Thus, tetrahydrophthalic anhydride results from the Diels-Alder condensation of maleic anhydride and butadiene, as the following equation indicates:



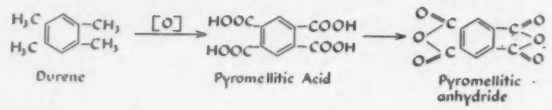
A similar reaction between maleic anhydride and cyclopentadiene provides endomethylene tetrahydrophthalic anhydride, as the following equation indicates:



When this latter material is treated with chlorine, substitution takes place in six positions to provide what is known as chlorendic or HET acid. The use of this chlorinated dibasic acid in alkyds is said to provide products with excellent solubility in a wide range of organic solvents as might be expected from the presence of the chlorine atoms. Also, this acid seems to have reduced functionality over phthalic anhydride, for which reason short-oil alkyds with very low acid numbers can be obtained. The presence of the chlorine atoms also tends to impart fire retardancy to the alkyds.

Another use for chlorendic acid is as a curing agent for epoxy resins where high heat distortion point and some fire retardancy are desired.

An interesting new acid for alkyd formation is pyromellitic anhydride, which is a benzene tetracarboxylic acid obtained by the oxidation of durene:



Because of the adjacent carboxyl groups, the acid exists in anhydride form, although it may also be obtained as the free acid. Because of its high functionality, it can be used in only very low concentrations in alkyds where it serves to increase the viscosity and bodying rate and leads to films with greater toughness and greater solvent resistance.

Acres of tank cars wait at the loading racks for propane, butanes, natural gasoline, alcohol and ethyl chloride produced at the National Petro-Chemicals Corp. plant at Tuscola, Ill. 1100 tank cars are required by the plant.

This concludes the comprehensive series of articles on "Petrochemicals for Paint." It is hoped that this series has given you an insight of the importance of petrochemicals in the technological growth of the coatings industry, particularly in the development of new raw materials of interest to the coating chemist.

The Editor

EPOXY-BASED MASONRY MATERIALS

(*From page 46*)

usually are at low pressures and it must be remembered that in the case of vinyl liners, the gas may penetrate the spaces between the vinyl and the concrete pipe.

Resistance to water absorption and chemical attack is determined in the laboratory on free, unsupported film cast at 25 mils thickness. Small sections, 2" x 2", were immersed in various sanitary and industrial waste solutions for a period of 100 days. Table I represents the waste solutions, the percent weight gain of the specimens and the effect on the film cast from an epoxy-polysulfide blend.

It may be seen from these observations that these epoxy liners may be used to coat concrete tanks and steel tanks; for that matter, for holding various chemical solutions, oils, fuels, etc. Gasoline and jet fuel have been stored in concrete tanks lined in this manner.

Material	Type Waste	% Weight Gain	Film Observation
Tap Water	Sanitary	1.1	Dulls finish
Chlorox, 1%	"	0.8	" "
Lysol, 1%	"	4.1	" "
Gasoline	"	1.0	Unaffected
Cooking Oil	"	0.3	"
Surf, 2%	"	1.0	"
Sodium Hydroxide, 1%	Industrial	1.5	Dulls finish
Sodium Hydroxide, 10%	"	1.3	" "
Sulfuric Acid, 1%	"	2.4	Unaffected
Sulfuric Acid, 10%	"	5.8	Lightens color
Sodium Chloride, 5%	"	1.0	Unaffected
Pine Oil	"	6.0	Darkens color
Acetic Acid, 1%	"	4.5	Dulls finish
Acetic Acid, 5%	"	1.9	Unaffected
Hydrochloric Acid, 1%	"	1.1	" "
Hydrochloric Acid, 10%	"	2.2	Lightens color
Oleic Acid	"	3.3	Darkens color
Acetone	"	1.3	Softens & swells

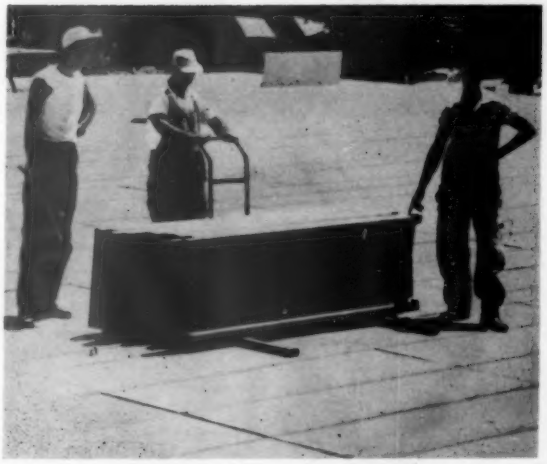
Table I. Chemical resistance of sewer pipe coatings.

Repairing Concrete

General repair and restoration of concrete and other masonry has usually been done with various water-mixed cements, sometimes using special binders or additives. These, as has been discussed in the section on flooring compounds, have usually been additives like neoprene latex, polyvinyl acetate and sodium siliconate. However, expensive preparation—cutting, chipping and notching—had usually been required to provide a mechanical bond. Such repairs consistently fail because of shrinkage during and after application, because of water seepage and atmospheric attack, and because of the poor adhesion to the old concrete or masonry. The unusual properties of epoxy resins, especially the liquid resins, lend these materials to the very difficult problem of repairing spalled, cracked and generally deteriorated concrete and masonry.

To make a joint strong enough, a liquid adhesive must be solidified and this can be done in several ways. A solid, dissolved in solvent, can be allowed to dry out. This is suitable for porous materials. For non-porous materials, an adhesive free from solvents must be used. One way is to freeze a molten liquid such as sealing wax. Another is to use a liquid, the molecules of which can be made to polymerize and/or crosslink with each other in situ. Liquid epoxy resins fall into the latter category. They will penetrate into all voids, providing a continuous joint, and will not shrink or expand during and after curing, nor produce reaction products. Thus, the bond is usually stronger than the joined material.

Properly formulated epoxy compounds, as masonry welding cements, are being used on a wide scale today for permanent repair and restoration of old concrete and for new construction. These welding cements have been used to fill and seal large cracks and voids and deep cleavages. Even hairline cracks may be sealed without opening them, by use of an unfilled liquid epoxy compound. The cements have been used for joining of pre-cast concrete slabs of all shapes, for joining of tile where the grouts must be



Workmen refinishing a roof with cement slabs using an epoxy-based adhesive.

absolutely waterproof and resistant to vibration and chemical attack, and for setting overhead and vertical tile without the use of temporary supports. Epoxy cements are used to join and repair clay pipe, terra cotta, etc. for restoring stone, brick and concrete architectural detail. They may even be used to join glass and glass brick, wood, plastics and metals to concrete and other masonry.

The materials for compounding these cements are based on a number of liquid epoxy resins which have been discussed throughout this paper. Reactive diluents such as butyl glycidyl ether and 1, 4, butane diol diglycidyl ether may be used to reduce viscosity of the liquid resins. The pure or modified epoxy resins are used in conjunction with polyamine curing agents such as diethylene triamine and triethylene tetramine. Resinous polyamides, polysulfides, and resinous polyamines such as Lancast A have found even wider use than the primary polyamines.

Methods of filling these liquid systems are quite varied. The various aggregates discussed in previous sections are an excellent means of making mortar

Dispersing, wetting, emulsifying, and stabilizing agents for the preparation of emulsion paints based on oils, resins, styrene-butadiene, polyvinyl chloride, and polyvinyl acetate.

DEUTSCHE HYDRIERWERKE GMBH
Germany **Düsseldorf**

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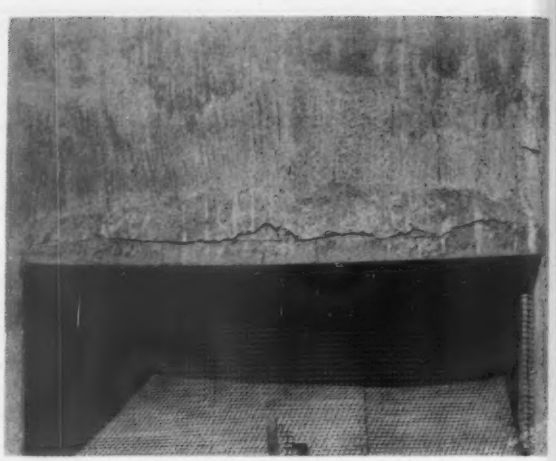
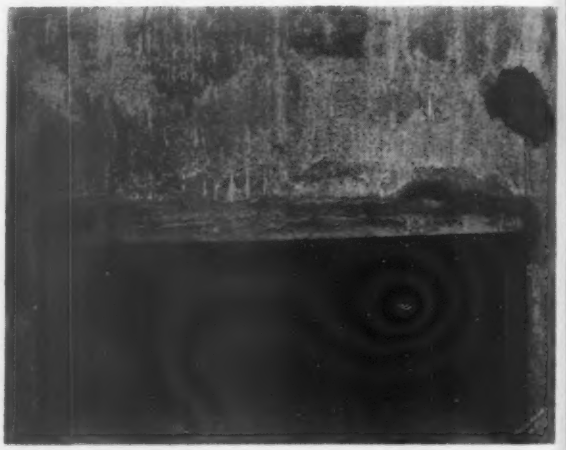
EAST COAST: Canerpa Limited, Suite 223, Drummond Building, 1117 St. Catherine Street West, Montreal. **CENTRAL:** Canerpa Ltd., 137 Wellington St. W., Toronto. **BRITISCH COLUMBIA:** The East Asiatic Co. (B. C.) Ltd., Marine Building, Vancouver 1, B. C.





Above: Close-up of cracked wall. Below: Same wall after having been repaired with epoxy cement.

mixes. Depending on the particular application, extender pigments such as magnesium and aluminum silicates, calcium carbonates, water ground mica, etc. may be used to fill both the liquid epoxy resins and the resinous hardeners. In many cases, the fillers may be blended on a pound for pound basis with the liquids. Dispersion is usually done by simple mixing or by the use of doughmixer type of equipment. It is often necessary to incorporate thixotropic agents in the filled epoxy resins to prevent sagging on overhead and vertical applications.

These then are some of the present methods of utilizing epoxy resins in masonry construction, repair and maintenance. This report is merely an indication of the many possibilities offered by the presently available materials, possibilities which can be as broad as the inventive imagination of chemists and engineers. What the future holds in new developments in basic raw materials and new developments in epoxy resin chemistry are today being investigated in research laboratories. This is how creative chemistry provides new raw materials for use by the protective coatings industry.

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LOW REFRACTIVE PIGMENTS

(*From page 41*)

have an increasing effect on viscosity, and consideration is being given to the use of this effect for the replacement of a portion of water-soluble thickener. Investigation is also being made of the usefulness of "Micro-Cel" in the production of thixotropic emulsion paints.

Flatting Effect

The fine size and unique particle structure of the "Micro-Cel" products have been found to confer substantial benefits in flatting efficiency. There has been a marked trend in the last few years toward the acceptance of exterior house paints of initially flat appearance, in preference to conventional paints which lose their gloss non-uniformly as they age. Formulation of flat exterior house paint poses an obvious dilemma. The lessons of years of exposure experience with regard to optimum PVC levels must be reconciled with the need to achieve low-luster paints uniformly low in sheen and free of "flashing" effects. This has not been a simple task with conventional flatting extenders. In "Micro-Cel E", formulators have a new tool for the achievement of exterior paints with uniform low luster at relatively modest pigment volume concentrations. A typical formulation is shown in Table 4. Similar effects have been observed in interior flat wall paints, although here the absence of stringent durability requirements allows greater latitude in pigmentation at high volume levels.

Unlike the rate at which new products in other classes of coating raw materials come pouring out of the laboratories, new developments in extender pigments are relatively infrequent. The novelty and uniqueness of the synthetic "Micro-Cel" products have aroused widespread interest. Not the least attractive feature of these silicates is the fact that, being the product of a controllable synthetic process, they are amenable to modifications dictated by use experience. Particle size and structure are both susceptible to control. It is already apparent that ingenious formulators will find in these materials some new and better answers to many technical problems.

	Pounds	
	With Micro-Cel	Without Micro-Cel
Water	150.0	150.0
Potassium Tripolyphosphate	2.0	2.0
"Advawet No. 33" (or equivalent)	4.0	4.0
Water Dispersible Lecithin	4.0	4.0
"Carbitol" Acetate	10.0	10.0
Ethylene Glycol	10.0	10.0
"Titanox RA-50" (or equivalent)	200.0	200.0
"Micro-Cel C"	30.0	—
"Nytal" 300 Talc (or equivalent)	66.0	102.0
"Snowflake Whiting" (or equivalent)	110.0	110.0
2% Methyl Cellulose, 4000 cps	50.0	50.0
Defoamer	1.5	1.5
Water	65.0	65.0
2% Methyl Cellulose, 4000 cps	65.0	65.0
Vinyl Acetate Copolymer, 55% Solids*	410.0	410.0
	1177.5	1183.5
Plus, preservative	(variable)	
Yield, each paint	Approximately 103 gallons	
Total Solids (pigment and binder)	54%	
Consistency	68 K.U.	66 K.U.
pH	6.6	8.4
Contrast Ratio, 3-mil (wet) film on Morest chart	0.951	0.936

*= With emulsions of lower solids content, a quantity of PVAc emulsion yielding equivalent solids is used, and less water is added in the previous stage.

Table 2. Vinyl acetate copolymer paints, with and without "Micro-Cel," at 39 per cent PVC.

	30% PVC		60% PVC	
	(Pounds per approximately 100 gallons)			
	A	B	C	D
TiO_2, Rutile	200	200	200	200
Micro-Cel C	30	—	35	—
Talc	66	105	123	165
Whiting	110	110	140	140

Table 3. Pigmentation (refer to Figures 5 and 6).

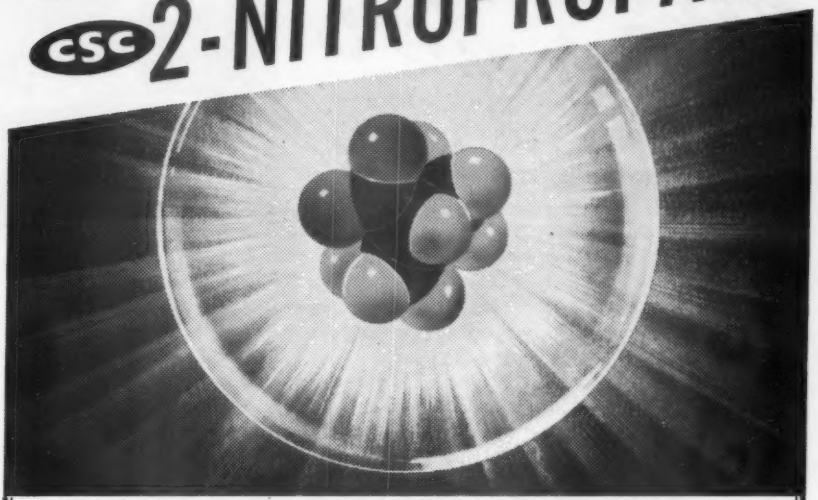
	Pounds
Rutile TiO_2, Medium Chalk Resistant	200
Calcium Carbonate, 2.5-25 microns	183
"Micro-Cel" E	54
"Thixcin" (or equivalent)	4
Alkyd Solution, 40% Solids (Note 1)	514
24% Lead Naphthenate	4
6% Manganese Naphthenate	1
Anti-skinning Agent	1
Mineral Spirits	69
	1030
Plus, anti-mold agent	(Variable)
Yield	Approximately 100 gallons
Total Solids, by weight	62.8%
Vehicle Solids, by weight	35.0%
Consistency (overnight)	86 K.U.

Note 1: Such as Aroflat 3025 or equivalent.

Table 4. White alkyd flat exterior house paint at 40 per cent PVC.

MEDIUM BOILING, MILD ODOR, UNUSUAL SOLVENT POWER

CSC 2-NITROPROPANE



USES

- Medium evaporating solvent in acrylic resin.
- Powerful economical solvent for vinyl acetate and vinyl chloride co-polymers.
- Solvent for nitrocellulose, and cellulose acetate butyrate.
- Preferred solvent in preparation of epoxy resin finishes.

PROPERTIES: 2-NITROPROPANE $CH_3CHNO_2CH_3$

Molecular Weight	89.09
Specific Gravity at 25/25°C	0.986–0.990
Pounds per U.S. Gal. at 68°F	8.24
Boiling Pt. at 760mm, °C	120.3
Flash Pt., °F (Tag Open Cup)	103.0
Solubility ml per 100 ml:	
Product in Water, 20°C	1.7
Water in Product, 20°C	0.6

CSC CHEMICALS FOR INDUSTRY

ALCOHOLS

Methanol Butanol
Ethyl Alcohol

AMINES AND AMMONIA

Ammonia, Anhydrous and Aqua
Ammonium Nitrate, Solid and 83% Sol.
Methylamines
Benzyltrimethylammonium Chloride
Hydroxyethyltrimethylammonium-bicarbonate

ESTERS

Amyl Acetate Butyl Acetate
Butyl Lactate Butyl Stearate
Dibutyl Phthalate Ethyl Acetate
Tributyl Phosphate

NITROPARAFFINS

Nitroethane 2-Nitropropane
Nitromethane 1-Nitropropane
Alkaterges Diamines
Aminohydroxy Compounds
Nitrohydroxy Compounds
Chloronitroparaffins

PHARMACEUTICALS, BULK

Bacitracin Cycloserine
Riboflavin, U.S.P. and U.S.P., R.S.

OTHER CHEMICALS

Acetone Formaldehyde
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The author continues his random reflections on various aspects of the paint industry. The opinions expressed in this column are his alone and do not necessarily reflect those of this publication.

Arrhenius Equation

OCCASIONALLY a published paper merits the attention of a wider audience than the specific group to which it was originally addressed. Such a paper is "The Arrhenius Equation in Accelerated Aging Studies" by Fred H. Steiger. It appeared in the May 5, 1958 issue of the *American Dyestuff Reporter*.

Steiger's paper is noteworthy because the basic technique he describes is known to all students of chemistry and because the end-use he discusses has broad application. Its value to paint studies will be immediately evident to the reader who peruses the following highlights.

Performance Prediction

"In the development of a new product, chemists frequently are required to determine the potential life of a material, either in storage

Phil Heiberger

or in use. Since the requirements of industry necessitate knowing the expected stability as soon as possible, accelerated aging tests must be used. These generally consist of storage at elevated temperatures. Such tests, however, provide information only on the minimum storage time. For this minimum not to be too pessimistic, the temperature of the accelerated test must be close to that of actual conditions in which case little acceleration is achieved. The choice of a temperature then is a perplexing situation.

"The purpose of this paper is to demonstrate, for those interested in predicting future performance, the value of the Arrhenius equation in dealing with aging studies."

Background

"Arrhenius expressed the effect of temperature on the rate of reaction by the expression:

$$\frac{d\ln K}{dT} = \frac{E}{RT^2} \qquad (1)$$

where k is the rate constant of the reaction, R is the univeral gas constant, T is the absolute temperature and E is an equation

constant. If E is assumed to be independent of temperature, the above expression may be integrated to

$$\ln K = \frac{-E}{RT} + I \qquad (2)$$

where I is an integration constant.

"The constant E represents the heat of activation or the energy required to convert unreactive molecules to 'active' ones. This quantity may be determined by plotting ln K against 1/T since equation 2 shows the slope of such a plot to be $-E/R$. The integrated form of the Arrhenius equation is used most frequently to calculate the heat of the activation of a reaction."

Advantages of Arrhenius Equation

"The phenomenon of aging, which we attribute to inanimate items, may be treated as a single chemical or physical reaction or a series of reactions of that item with itself or its environment. Since the rate of most of these reactions is dependent on temperature, it is possible to use the Arrhenius equation to solve problems involving the aging of materials.

"As long as the heat of activation is independent of temperature, the logarithm of the rate of reaction will yield a straight line when plotted against the reciprocal of the absolute temperature at which the reaction takes place. Extrapolation of this straight line is the key to the use of the Arrhenius equation in aging studies. In this way data obtained at high temperatures is used to predict stability in temperature regions which would require considerable additional time to determine experimentally. This solves the chemist's dilemma of how to determine maximum storageability in minimum time.

"In using the Arrhenius equation to predict storageability of a material, the chemist first must decide on the point which will be considered the end of the product's useful life (gelation, precipitation, specified degree of discoloration, specified application property, etc.). The time to reach this end point at a series of constant temperatures then must be determined. This may be done easily if the property can be measured at each temperature as a continuous function of time. The time to the end point then may be determined by interpolation.

"Since the Arrhenius equation applies to relatively short temperature intervals, extrapolation of the straight line over large temperature ranges may not always be justified. In such circumstances the high temperature results would give an early indication of what is to be expected. As the tests are complete at intermediate temperatures the predictions may have to be modified. Finally, the most accurate results would be obtained from the lower temperatures which, of course, would take the longest time. Thus, in obtaining the data, the chemist could decide at which point the possible error in accuracy is worth the gain in time. Conventional accelerated tests offer no such choice.

"At sufficiently high temperatures, the nature of the aging may change. Components, for example, may be boiled off rather than reacted. The researcher would be warned of such a change by an alteration in the slope of the Arrhenius plot. If a conventional accelerated aging test were run at a temperature where the predominating aging mechanism differs from the normal one, there would be no clue. Then, application of the high temperature data to the milder conditions could yield erroneous results."

Areas of Use

"Yellowing — The Arrhenius equation has been employed in a study of the tendency of nylon to yellow.

"Antistatic Effect — (Since) antistatic agents lose (their) effect after application to a fabric, (this) phenomenon (was studied.)

"Bath Life — A shorter version of a product stability study is the evaluation of the bath stability of a catalyzed thermosetting resin.

"Curing Studies — One instance where instability rather than stability may be sought is in measurements of the speed of curing of a finish. In such instances the Arrhenius equation permits the accurate translation of data from one temperature to another."

One Part Per Million

OIL Paint manufacturers, still plagued by the problem of *complete* odor elimination, may want to keep an eye on the progress of MIT scientists who are working on a closely related problem—flavor control.

According to *Report on Research* (MIT) *9*, 1-2 (1958), objective means for detecting, identifying, and isolating trace chemicals are being developed as an aid in producing food of better flavor. Recent research indicates that a number of trace components, in concentrations as small as one part per million, may be highly important in contributing to the flavor.

Research workers in the Department of Food Technology have isolated three new fatty acids which are the flavor complex of milk. It has been found that different combinations of these three fatty acids result in totally different flavors.

Beer In The Batch?

IN the annals of the paint industry you will find that many remarkable and remarkably weird ingredients of extremely doubtful value have been dumped into paint and varnish batches from time to time. Such raw materials as tobacco juice, spit, "snake oil," old tires, herbs, beetles, and dried blood, for example, have been thrown in with varying success. But, to date, as far as I know, beer, with or without a head, has never been given a fair shake. Maybe now is the time for all good water paint manufacturers to consider this potentially magic potion.

The idea of utilizing the speculative dormant powers of this sometimes intoxicating beverage sprouted in my mind after reading about a recent British patent (#782, 081) which covers a hair shampoo consisting of a mixture of beer and detergent.

If beer can improve lathering and cleansing properties of shampoo, it can measurably improve rinsability, and can make it possible to set hair in "a fairly lasting manner without aid of setting or fixative lotions," as claimed—if beer can do all this for hair, I say—who knows what it might be persuaded to do for paint?

News about

B.F.Goodrich Chemical *raw materials*

GEON VINYL latices for outstanding outdoor performance

TWO new Geon latices, developed by B.F.Goodrich Chemical's polymer specialists, offer superior performance and broader latex applications. The photos show both wood and masonry exteriors on which the benefits of these new latices have been proved.

A VINYL CHLORIDE—ACRYLIC COPOLYMER, GEON 450X3, for use as a binder in outdoor paint, offers these remarkable advantages:

- internally plasticized to simplify paint manufacture
- exceptional adhesion—bonds well to wood, asbestos and masonry
- unusual light and weather stability
- low water-vapor transmission — provides an outstanding moisture barrier

A UNIQUE POLYVINYL ACETATE LATEX, GEON 970X11, especially for interior and exterior masonry, offers these advantages:

- stability and uniformity
- tough, flexible films showing good water and scrub resistance
- low water-sensitivity plus good alkali resistance

Get information on properties of both of these new latices. Write for booklet of samples to Dept. LK-4, B.F.Goodrich Chemical Company, 3135 Euclid Ave., Cleveland 15, O. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

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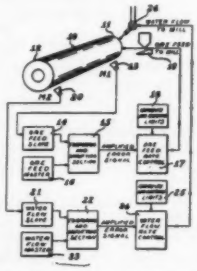
GOOD-RITE chemicals and plasticizers • HARMON colors

PATENTS

Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired (to foreign countries $1.00 per copy) to the publisher.

Automatic Control For Wet Grinding Mills

U. S. Patent 2,833,482. David Weston and Stewart W. Daniel, Toronto, Ont., Canada; said Daniel assignor to David Weston, Toronto, Ont., Canada.



U. S. Patent No. 2,833,482

The method of controlling the feed to a wet grinding mill of liquid and solid feed components, which method comprises; continuously producing a first electrical signal which varies with mill loading in the region of the inlet side of the mill; continuously producing a first reference signal of predetermined magnitude corresponding to a desired mill loading; comparing the first electrical signal with the first reference signal; varying the rate of feed of solid feed component to the mill responsively to the difference between said signals whereby the rate of solids feed is increased when the mill loading is too low and vice versa; continuously producing a second electrical signal which varies with viscosity of charge in a selected region of the mill; continuously producing a second reference signal of predetermined magnitude which corresponds to a desired viscosity; comparing the second electrical signal with the second reference signal; and varying the rate of feed of liquid feed component to the mill responsively to the difference between said second signal and said second reference signal whereby to increase the rate of feed of liquid feed component when the viscosity is too high and vice versa.

Polypropylene Waxes

U. S. Patent 2,835,659. James E. Guillet, Kingsport, Tenn., assignor to Eastman Kodak Co., Rochester, N. Y., a corporation of New Jersey.

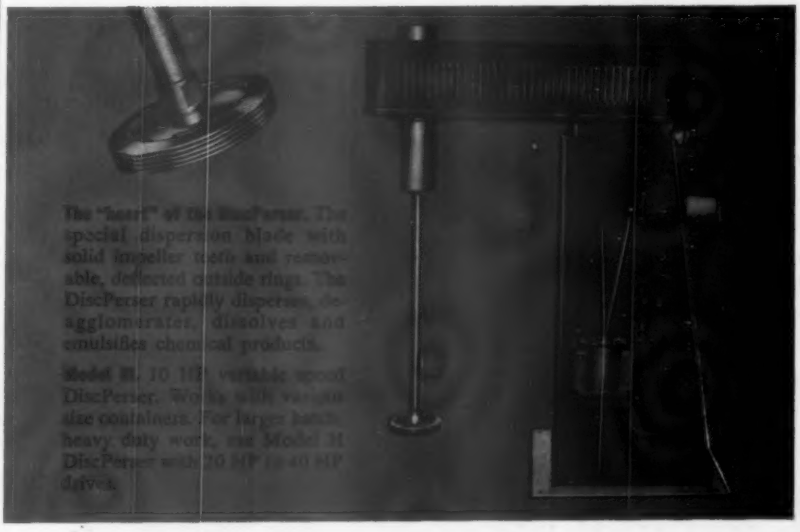
The method of making a synthetic wax having low melt viscosity in combination with high hardness and high softening point which comprises heating, at a temperature of 300-450°C., crystalline polypropylene having a density of at least 0.90 and an average molecular weight of at least 20,000, until the molecular weight is reduced to a value within the range of 1000-8000.

A synthetic polypropylene wax which is readily flowable in molten form and which has an average molecular weight in the range of 1000-8000, a density of at least 0.90, an ASTM D36-26 ball and ring softening point of at least 130°C., an ASTM D5-52 penetration hardness value of 0 at 100 g. load for 5 seconds and below 2 at 250 g. load for 5 seconds, and an acid number of substantially zero.

Interpolymers of Styrene With Drying Oils

U. S. Patent 2,833,733. Jack Andrews Coltrell and Donald Helmsley Hewitt, London, England; Ernest Booth and Richard H. Buckle, executors of said Donald H. Hewitt, deceased, assignors, by mesne assignments, to The Sherwin-Williams Co., Cleveland, Ohio, a corporation of Ohio.

A process for the production of liquid styrenated drying oil fatty acids comprising heating a styrene-partially polymerized drying oil copolymer with an alkali metal hydroxide under reflux to saponify said copolymer, acidifying said saponified copolymer with a dilute mineral acid, and separating the styrenated drying oil fatty acids from the reaction mixture.



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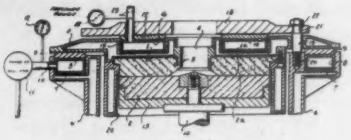
*City*_____ *Zone*____ *State*_____

Colloid Mill

U. S. Patent 2,833,483. Frederick J. E. China, London, England.



U. S. Patent No. 2,833,483

A colloid mill comprising: a rotor and a stator both having plane working faces normal to the axis of rotation of the rotor and arranged one above the other, an annular flexible walled pneumatic cushion completely coaxially surrounding the axis of the stator and operable to exert pressure against the stator independently of the rotor and in a direction away from the rotor, another annular flexible pneumatic cushion also completely coaxially surrounding the axis of the stator and operable to exert pressure on the stator in the direction of the rotor, and means for supplying gaseous fluid under different pressures to both cushions.

Drying Oil Polymer Containing Phosphorus Compound

U. S. Patent, 2,836,508. Thomas L Canniff and Alfred E. Balocca, Wheaton, Ill., assignors to American Can Co., New York, N. Y., corporation of New Jersey.

A coating composition comprising an oily liquid conjugated diolefin polymer synthetic drying oil formed using a boron trifluoride polymerization catalyst, and from 0.5% to 4.0% by weight of said drying oil polymer of a phosphorus compound having at least one replaceable acidic hydrogen atom, said diolefin containing 4 to 6 carbon atoms, and said polymer having a molecular weight of about from 1600 to 1800 and a relative viscosity of about from 1.15 to 1.25.

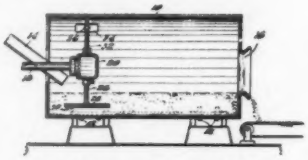
Method of Producing Cresol-Formaldehyde Coating

U. S. Patent 2,834,745. Gene C. Weber, Hermosa Beach, Robert P. Hoyt, Redondo Beach, and Robert L. Dinsmore, Long Beach, Calif., assignors to Richfield Oil Corp., Los Angeles, Calif., a corporation of Delaware.

A method of producing a cresol formaldehyde polymer coating composition containing about 25 to 97 parts by weight of the polymer, said polymer being substantially insoluble in liquid aliphatic hydrocarbons after curing, which comprises heating a mixture of the cresol and formaldehyde containing about ¼ to 5 mols of formaldehyde per mole of cresol, in the presence of a basic catalyst to effect polymerization until the formaldehyde is virtually all reacted and the product when cooled to about 70 to 120°F. is in the fluid state, quenching the reaction mixture with water, immediately removing catalyst and water from the reaction mixture, reheating the reaction mixture to polymerize it until it approaches a semi-solid state when at room temperature, cooling the reaction product, adding to the reaction product about 3 to 10 parts by weight of a solvent selected from the group consisting of low boiling, lower aliphatic alcohols and low boiling, lower aliphatic ketones, said alcohols and ketones being volatile under normal atmospheric conditions, and mixing about 5 to 60 parts by weight of an inorganic filler with the reaction product-solvent mixture.

Apparatus For Wetting Finely-Divided Pigments

U. S. Patent 2,834,044. Randolph Antonsen, Boston, and Robert D. Beattie, Cambridge, Mass., assignors to Godfrey L. Cabot, Inc., Boston, Mass., a corporation of Massachusetts.



U. S. Patent No. 2,834,044

In apparatus for pelleting finely-divided pigments, including a rotatable drum, the improvement which comprises a fixed liquid supply conduit extending into said drum approximately in the axis thereof, a substantially liquid-tight swivel joint connected to and supported by the discharge end of said conduit, a longitudinally adjustable branch conduit radially connected into the swivel joint, a spray distributor connected to the end of said branch conduit, adjustable counterbalancing means for the branch conduit and spray distributor affixed to the swivel joint, and means to deliver liquid under pressure to the supply conduit.

Remove "Fish Eyes", Skins, Incidental Solids and Semi-Solids from Varnish and Lacquer with . . . .

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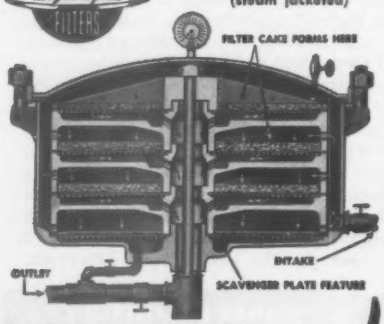
Many varnish makers now use Sparkler Filters to clarify varnish, lacquers, and other clear liquids. The brilliance and polish obtained by filtering with Sparkler Filters is far superior to results obtained with other methods of clarifying paint products.

Our engineers are ready to give personal attention to your problems.

Model 18-S-12 Varnish Filter (steam jacketed)



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•

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Patent Practice before U. S. Patent Office. Validity and Infringements Investigations and Opinions.

PERSONNEL CHANGES

BARRETT

Robert K. White has been appointed marketing manager of Plaskon plastics and resins, it has been announced.

R. K. White

In his new capacity, Mr. White will be responsible for the development and execution of marketing programs and the coordination of marketing areas. He will also head up sales and marketing personnel development.

Before joining the firm in 1952, he received experience in sales and merchandising with Swift & Co.

SUN CHEMICALS

The firm has announced the following changes in the A. C. Horn Companies, a major subsidiary.

Robert W. Smith has been appointed vice president, **J. Bolzak** has been named traffic manager of the paints and finishes group, and **B. R. Hale** has become vice president of the products finishes division.

Mr. Smith was formerly manager of the Canadian division and has been with Horn in that area since 1946. He will continue making his headquarters in Toronto.

Mr. Bolzak has been with the firm for more than four years as assistant traffic manager.

He is a graduate of the Academy of Advanced Traffic. He will be headquartered in Horn's Long Island City plant.

Mr. Hale joined the firm immediately after graduation from Lehigh University in 1930.

UNITED WALLPAPER

Howard N. Wedelstaedt is now in charge of central purchasing, it has been announced.

In his new position, Mr. Wedelstaedt will coordinate the purchasing activities for the company's plants throughout the country.

Prior to joining the organization in 1956, he had been associated with Sears, Roebuck & Co. as a retail division manager.

Mr. Wedelstaedt is a graduate of the University of Illinois and holds a B.S. in marketing.

NATIONAL LEAD

Allan G. Davies has been named New York district sales manager and **Henry E. Melvin** has been transferred from Los Angeles to San Francisco as senior salesman, it has been announced.

Mr. Davies joined the firm in 1945. He had formerly been associated with Sherwin-Williams Co.

Mr. Melvin holds a B.S. degree from Georgetown University. He joined the company in 1946. Previously, he had worked for the J. T. Baker Chemical Co.

Also announced was the appointment of **David A. Sonnenmair, Jr.** as a salesman in Los Angeles.

Mr. Sonnenmair, who holds a B.S. degree in economics from the University of Pennsylvania, was first employed at the company's Baltimore branch in 1952.

SINCLAIR CHEMICALS

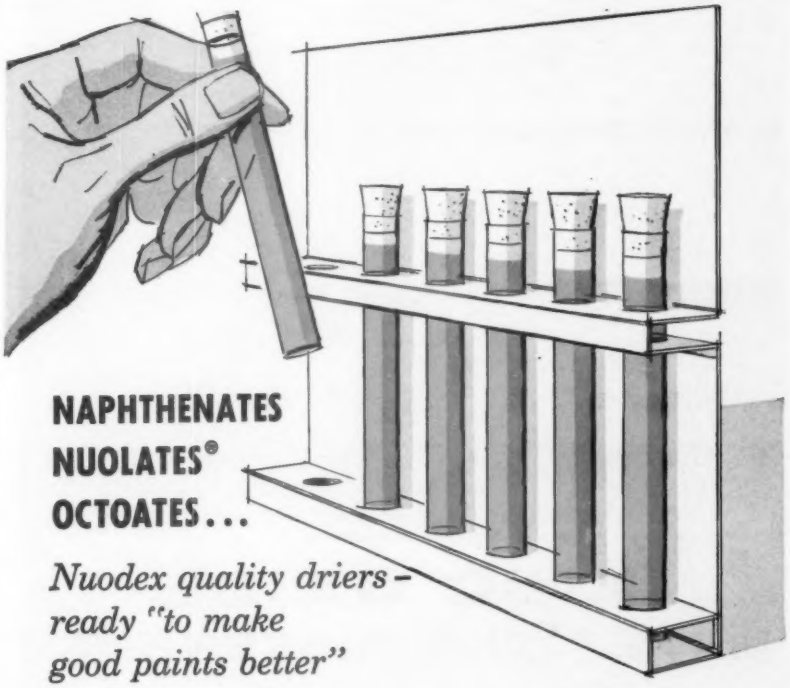
William J. Arnold has been appointed sales representative, it has been announced. He will maintain headquarters in New York.

W. J. Arnold

Prior to joining the organization, Mr. Arnold was employed by Pfister Chemical Works and later by Sinclair & Valentine Company.

He received his Bachelor of Science degree in chemistry from Rutgers University.

Mr. Arnold's territory will include metropolitan New Jersey and New York and portions of Connecticut and Massachusetts.



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Each of the Nuodex drier groups continues to set the standards in its field. From their start in 1932, the Nuodex Line has meant quality: in metal content, purity, viscosity, color and odor.

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THREE LITTLE BOTTLES
THAT BUILT THE PLANT

COLUMBIAN CARBON

Donn Snyder, formerly manager of the Boston sales office, has been transferred to the principle office of the firm in New York as assistant to the sales manager and **Thomas E. Weaver** joins the company as the new manager of the Boston office, it has been announced.

D. Snyder

T. E. Weaver

Mr. Weaver comes to the company from the Boston office of Spencer Kellogg & Sons.

Other changes involve the transfer of **John F. Stiff** and **Edward I. Bosworth.**

Mr. Stiff, formerly manager of the Detroit sales office, has moved to New York as eastern district sales manager.

Mr. Bosworth has been transferred from the Akron office to become branch manager in Detroit, replacing Mr. Stiff.

NOPCO

Charles Lighthipe has been appointed to the post of technical director of the industrial laboratories and **Dr. Ramsey Christian** has been named to the position of director of the industrial development laboratories.

Departments under the management of the industrial laboratories include protective coatings and metal working.

DAVISON

F. Emerson Ivey, Jr. has been named manager of chemical technical service activities of the firm, a division of W. R. Grace & Co., it has been announced.

F. E. Ivey, Jr.

Mr. Ivey, formerly in charge of petroleum catalysts technical service, came to the company in 1948 from Gulf Oil Corporation.

He is a chemical engineering graduate of Lehigh University.

Also announced was the appointment of **Michael M. Dexter** to work in the division's technical service laboratory at Curtis Bay. He will be responsible for developing applications for Syloid silicas in finishes.

Mr. Dexter had been previously associated with Minnesota Mining & Manufacturing Co. He holds a chemical engineering degree from New York University.

AMSCO

George H. Schulz has been elected senior vice president, **James V. McLaughlin** has been named treasurer, and **William M. Harris, Jr.** has been elected assistant treasurer, it has been announced.

J. V. McLaughlin

G. H. Schulz

Mr. Schulz was formerly vice president and treasurer with headquarters in Chicago. He has been with the firm since 1941.

Mr. Schulz is a graduate of the Harvard Graduate School of Business Administration.

Mr. McLaughlin has been with the company since 1938. Prior to his election, he was assistant treasurer. He is a graduate of New York University.

Mr. McLaughlin's headquarters will be located in Murray Hill, N. J.

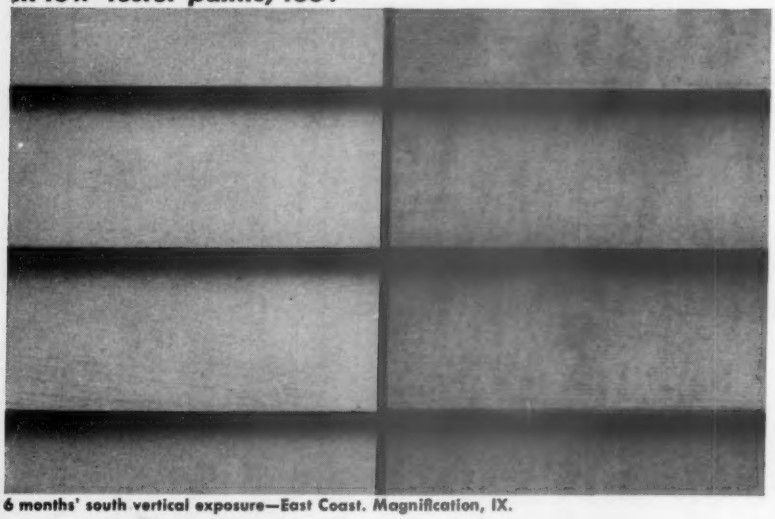
Mr. Harris joined the firm in 1936. He has been tax manager and chief accountant since the opening of the Murray Hill office in 1956.

Richard R. DeGraf has been appointed a sales representative, it has also been announced.

He will represent the company in the San Francisco Bay area with headquarters at the Oakland Terminal.

Mr. DeGraf had been formerly associated with Cole & DeGraf.

In low-luster paints, too:



6 months' south vertical exposure—East Coast. Magnification, IX.

ZINC OXIDE
MAKES THE DIFFERENCE

If you're concerned about the fitness of low-luster paints for exterior use . . . keep these photos in mind. AZI's recommended formulation (left) and a commercial, zinc-free, low-luster paint (right) were subjected to simultaneous exposure. The correct concentration of zinc oxide kept AZI's sample completely free of mildew and spore growth. The other paint proved highly susceptible to attack . . . deteriorated rapidly.

Tests like this further verify this fact:
An adequate ZnO content raises the level of performance of outside low-luster formulations . . . just as it improves the service and appearance of any good paint. It improves durability and film integrity . . . resists mildew, staining, and the distinctive effects of ultraviolet light . . . imparts superior chalking characteristics.

Mail the coupon below. You'll receive laboratory reports as available on the use of zinc oxide in conventional and low-luster formulations — to assist you in assuring the quality of your exterior paints.

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Please send me future laboratory reports and papers on paint formulation findings.

Name_____ Title_____
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REICHHOLD CHEMICALS

Ralph T. Urich has been appointed vice president—general sales manager and **Herbert L. Wampner** has been named director of research, it has been announced.

H. L. Wampner

R. T. Urich

Mr. Urich, who joined the company in 1939, was first associated with sales and research concerned with the firm's inorganic pigments. In 1953, he was named general manager of the New England Division and two years later was elected vice president.

Since joining the firm in 1943, Mr. Wampner has held the position of technical director of the Pacific Coast Division.

He is a graduate of the Massachusetts Institute of Technology.

Dr. Arthur Wooten has been appointed general sales manager of the New England Division, it has also been announced.

Dr. Wooten will have his headquarters at the Ballardvale, Mass. plant where he has been working as the division's technical director since 1957.

Dr. Wooten has been connected with the firm continuously since 1943. He received his doctorate from the University of Michigan in 1948.

Another announcement concerned the resignation of **Theodore S. Hodgins,** vice president in charge of research.

Mr. Hodgins has opened his own office as a chemical research consultant.

CARWIN

Charles F. Blaich Jr. has joined the sales department as technical representative, it has been announced.

Mr. Blaich will be responsible for sale and market development of the firm's line of special isocyanates and other chemicals for use in polymer manufacture.

Mr. Blaich was graduated from Lebanon Valley College and has a background of sales development experience with Du Pont Finishes Department and Armour Chemical Division.

NATIONAL CAN

W. Howard Winters has been named marketing manager, it has been announced.

Mr. Winters will coordinate such activities as sales promotion, marketing research and advertising for cans.

He had been previously associated with the southern division of Cryovac Co. in the capacity of sales manager.

He is a graduate of the University of Missouri, where he received a B.S. in business administration.

PACIFIC VEGETABLE OIL

Lowell Cummings has joined the staff, it has been announced.

He will head the surface coatings group of the firm's research and development department.

With 16 years experience in the surface coatings field, Mr. Cummings has specialized in oils, alkyd resins, enamels and oil and water-base paints.

He holds a master's degree from the North Dakota School of Paint Technology.

VAN AMERINGEN-HAEBLER

Robert W. Teegarden has been promoted to general manager of the Union Beach unit and **Byron N. Thompson** has joined the firm as technical service representative of the aromatic chemical department in New York, it has been announced.

Mr. Teegarden has served as head of the research department and in various other capacities since joining the company in 1932.

Mr. Teegarden holds a master's degree from New York University.

Prior to joining the firm, Mr. Thompson had been associated with the Glidden Co., where he was engaged in market research and sales to the chemical specialty industries.

He holds a degree in chemical engineering from Drexel Institute of Technology.

How to select, apply and disperse the 11 members of the Syloid family

New 12-page booklet tells what specific industrial applications each Syloid answers—and why!

What are the Syloids? What are their important typical chemical-physical characteristics? What are their individual properties? What Syloids should be used to create a flat finish? . . . in anti-blocking? . . . to thicken a liquid? . . . to remove moisture? . . . in adhesive formulations? . . . for insulation? What mixing techniques should be used for Syloid in a liquid, in a dry powder?

You'll find the answers to these and other questions in the just-off-the-press booklet, "The Davison Family of SYLOID SILICAS." We're sure you'll find it of great assistance in your everyday work. For your copy, just write to us on company letterhead.

DAVISON
CHEMICAL COMPANY
Division of W. R. Grace & Co.
Baltimore 3, Maryland

CARLISLE CHEMICAL

Ralph S. Binns has been appointed vice president, it has been announced.

R. S. Binns

In 1957, Mr. Binns was named to the post of general manager of the Advance Solvents and Chemical Division of the firm. He will continue in that position, making his headquarters at the Advance plant in New Brunswick, N. J.

Mr. Binns is a graduate of the University of Cincinnati with a degree in chemical engineering. He has been with the Advance Division since 1939.

DU PONT

Walter J. Beasten, New York district sales manager for the pigments department, has been appointed an assistant sales director of the department, it has been announced.

Mr. Beasten started with the company in 1924. He was a pigments salesman in the Philadelphia area for many years prior to 1952, when he was appointed manager of the eastern district sales office in New York.

Mr. Beasten attended the Newark College of Engineering.

H. Kenneth Carter will succeed Mr. Beasten as sales manager and **Joseph F. Alpaugh** has been named a west coast sales representative for the pigments department, it has also been announced.

Mr. Carter joined the firm in 1928 as a chemist. He has been in sales work for the past 13 years.

Since joining the organization in 1951, Mr. Alpaugh has been engaged in production, research, and most recently in technical service work. He will be headquartered in Pasedena, Calif.

ARCHER-DANIELS-MIDLAND

Willard J. Davis has been elected an assistant treasurer, it has been announced.

Mr. Davis joined the organization in 1942 after six months with the Minnesota State Income Tax Division.

Formerly assistant manager in the firm's tax department, Mr. Davis was named company analyst last September.

He is a graduate of Macalester College and the St. Paul College of Law.

Four promotions and changes in assignments in the transportation department were also announced.

They include **Glenn D. Carlson,** from traffic manager for grain and grain products to claims traffic manager; **Thomas F. Kuklinski,** to traffic manager for tank cars; **Willis L. Ford,** to traffic manager of the Minneapolis grain elevators; and **Robert G. Arend,** to traffic manager supervising shipments of resins and special oils.

The changes follow retirement of **George F. Moormann,** traffic manager for tank cars and claims.

UNION CARBIDE CHEMICALS

Dr. George H. Potter and **Alton H. Wallace** have joined the development department at South Charleston, W. Va.

Dr. Potter received his Ph.D. degree in organic chemistry from Rensselaer Polytechnic Institute in 1958.

Mr. Wallace received a B.S. degree from the University of Alabama in 1957. Prior to joining the firm, he served in the Corps of Army Engineers.

IDDINGS PAINT

Edward F. Maloney has been appointed to the position of sales manager, it has been announced.

Mr. Maloney had been previously associated with the chemical division of the National Dairy Products Corp. in engineering and sales capacities. During the past 14 years, he has been the sales manager and manager of the New York office.

Previously, he had been associated with the finishes division of E. I. Du Pont de Nemours & Co., Inc.

J. M. LEHMANN

C. W. Muller has been appointed sales manager, it has been announced.

Mr. Muller has been with the firm for the past 13 years, eleven of them in the engineering department as machinery designer and production engineer. For the past two years, he has served the company in a sales engineering capacity.

H. Kohnstamm & Co., color manufacturers for over 100 years, introduce their new line of color dispersions for water systems to be known as . . .

Kodis COLORS
TRADE MARK

These colors offer many outstanding properties and advantages including —

- Excellent alkali resistance
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NEWS

Stoner-Mudge Completes New Development Center

The Stoner-Mudge Co. has announced the completion of a research and development center that has more than doubled laboratory facilities.

The center is housed in a new 3-story addition to the company's north side Pittsburgh headquarters building. Coupled with the laboratory space in the main building, the addition gives the research and development department a total working area of almost 14,000 square feet.

Stoner-Mudge, a division of American-Marietta Co., is a producer of protective coatings (enamels, lacquers and varnishes) for the container industry. It also produces coatings for the paper, appliance, automotive, textile, metalworking and plastic industries.

The addition is of brick and concrete construction. It is fire-proof and air-conditioned throughout and is equipped to carry on a wide range of scientific investigation.

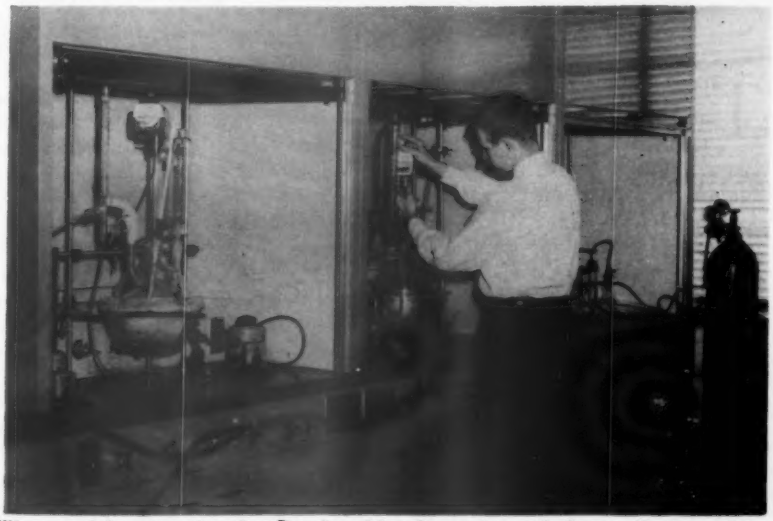
"The increased research and development facilities," said President F. R. Stoner, Jr., "were necessitated by our increased emphasis on applications for our products in the non-container fields. We are, for example, working on 176 research projects for 77 different end uses as of this moment."

It is anticipated that the new center will permit a further increase in laboratory staff. By the end of 1958, the research and development staff in Pittsburgh should number about 100.

Basic development work is performed at the headquarters laboratory and by a multiple fellowship at the Mellon Institute of Industrial Research in Pittsburgh. In addition, a Rochester, Pa. plant has a control section and plants at Azusa, Calif. and Colebrookdale, Pa. have control and development centers.

Technical service is provided overseas customers by foreign company-owned factories or licensees.

Experimental coatings are rolled onto metal plates in this roller coating machine, a laboratory-size model of commercial equipment.



The new laboratory has four banks of hoods as pictured above. Resin-making flasks are used in the endless search for new synthetic resins.

Experimental food packs are prepared in this process kitchen. Here, properties of finishing varnishes are viewed under a binocular microscope.

SUCROSE ACETATE ISOBUTYRATE IN LACQUERS

This sucrose derivative is said to offer broad advantages as extender for many coatings.

THE possibilities of sugar as an industrial raw material has fascinated chemists for many years. Working with the compact sucrose molecule with its unique combination of a 5 and a 6-member oxygen-containing ring, Eastman Chemical Products, has prepared dozens of sucrose derivatives each of which has been thoroughly evaluated in a variety of applications. One of these derivatives, sucrose acetate isobutyrate (or SAIB), has evidenced such promise that Eastman has commenced commercial production.

Sucrose acetate isobutyrate is formed by the esterification of sucrose with the unusual combination of acetic anhydride and isobutyric anhydride. The result is an extremely viscous (100,000 cps. at 30°C.) clear liquid of high molecular weight (847) with excellent stability and wide compatibility with most resins, film formers, and plasticizers.

Incorporated into coating formulations its behavior is intermediate between a resin and a plasticizer. Its extreme solubility is indicated by the low viscosity, approximately 700 cps. at room temperature, of 90 parts of SAIB in 10 parts of ethyl alcohol, as compared to its undiluted viscosity 100,000 cps. It is in solution with ethyl alcohol, identified as SAIB-90, that Eastman plans to market its new product, although the undiluted form will also be available.

As an example of its ability to extend solvent coating formulations, for instance, the solids content of a lacquer system based on ½ sec. RS nitrocellulose can be increased from 20% non-volatile to 33% by replacing one half of the nitrocellulose with SAIB with no increase in viscosity and no decrease in film hardness. Thus, greater surface area coverage per gallon of lacquer can be achieved with reduced solvent requirements. In addition to extending the solids content of solvent coatings, an improvement in the adhesion of many coatings has been noted.

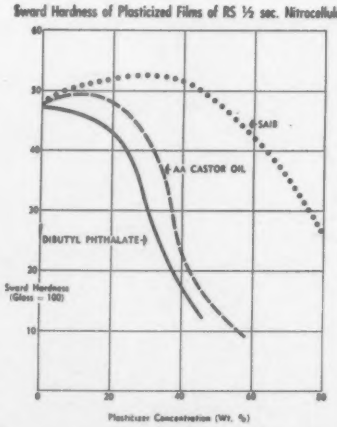


Figure 1. Nitrocellulose films can be modified with up to 50% SAIB without decreasing film hardness.

The ability of SAIB to extend the solids content of lacquer formulations at no loss in film hardness is demonstrated in Figure 1. Here the Sward hardness of nitrocellulose films plasticized with castor oil and with dibutyl phthalate are compared with films containing SAIB. It will be noted that the hardness of films containing SAIB increased up to 25% modification, returning to the hardness of the unmodified film at 50% modification. The hardness of films containing castor oil, on the other hand does not change up to 25% modification and decreases rapidly beyond this point. Dibutyl phthalate causes an immediate and rapid reduction in Sward hardness. It is also interesting to note that films containing as much as 80% SAIB and 20% nitrocellulose exhibit reasonable hardness characteristics. Sometimes a small amount of polymeric plasticizer is necessary in addition to SAIB to obtain proper flexibility.

In addition to solvent coatings, the high degree of compatibility of SAIB with resin and film formers has led to its investigation in hot melts. Cellulose acetate butyrate melts, for instance, have been produced containing as much as 70% of the sucrose ester without becoming tacky. Because of its high boiling point (over 550°F.), fuming at melt temperatures in the neighborhood of 350°F. is virtually non-existent. Only a slight color increase has been

SAIB is a clear, semi-solid material at room temperature with viscosity of about 100,000 cps. Extreme solubility is indicated by the greatly reduced viscosity, approximately 700 cps., of solution containing 90 parts of SAIB in 10 parts of ethyl alcohol.

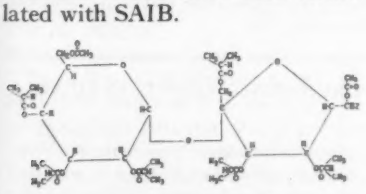
noted in such melts after 24 hours at 350°F., indicating excellent heat stability.

Among the various type coatings in which SAIB has been evaluated are wood lacquers, paper coatings, cloth coatings, metal lacquers, plastic lacquers, hot melt coatings, and peelable plastic coatings.

SAIB modified paper coatings have exhibited very high gloss, good adhesion, hardness, and scuff resistance. Gravure paper lacquers with over 30% non-volatile content at application viscosity have been prepared with SAIB which dry very rapidly. Extremely high modifications of paper lacquers with SAIB have resulted in coatings which are heat sealable at low temperatures and form very strong bonds.

Cloth coating lacquers modified with SAIB have been evaluated with over 32% solids content at application viscosity. These coatings have exhibited good toughness and low temperature flexibility.

High solids content metal lacquers with excellent hardness and good adhesion to aluminum and bonderized steel have been formulated with SAIB.



Sucrose derivative is formed by esterification of sucrose with acetic anhydride and isobutyric anhydride. Molecular weight 847. Structural formula illustrated above.

SAIB modified plastic lacquers with high non-volatile contents have been formulated which exhibit very good adhesion to a variety of plastics. Peelable plastic coatings based on cellulose acetate butyrate and SAIB have been formulated which exhibit excellent resistance to exudation.

Other unusual properties of SAIB include its rapid decrease in viscosity with slight increases in temperature. From 30°C. to 50°C., for instance, its viscosity drops from 100,000 to 4,800 cps. At 100°C. the viscosity of SAIB is only 86 cps. Its hydrolysis stability is excellent and its solubility in water at 25°C. is less than 0.1%.

Coating Courses Offered At Newark College

Two laboratory courses in coatings technology will be offered during the 1958 fall term at the Newark College of Engineering, it has been announced by Professor Clarence H. Stephans, director of the special courses division.

"Basic Coatings Laboratory Procedures," to begin September 24, will include the preparation of various oleo resinous vehicles, the study of the physical properties of the vehicles, incorporation of pigments in these vehicles, and chemical and physical tests of the raw materials used in the vehicles and pigmented coatings.

"Advanced Lacquer Technology," to start on September 30, will cover safety procedures for lacquer production and application, new ideas for nitrocellulose formulation, Ketone solvents and solvent evaluation, testing methods used in protective coatings, lacquer hard resins, P.E. based lacquer resins, plasticizers for vinyl coatings, multi-color resins, and dispersion of pigments in lacquer type vehicles.

The courses will meet during the evening hours for 12 consecutive weeks beginning in September. The courses will be conducted under the supervision of technical and engineering personnel from industry.

In addition to the coatings technology courses, a conference on chemistry and physics of pigments will be offered beginning October 8 in cooperation with the educational committees of the New York Paint, Varnish Lacquer & Assn., and the New York Paint & Varnish Production Club.

The conferences will run ten weeks during which time advanced technical information will be presented in the chemistry and physics of pigments.

•

Coast Sales Rep Named

The Jersey State Chemical Co. has appointed the Chemical Manufacturing Co., Inc. of California as west coast sales representative, it has been announced.

The new representative will manage sales and technical service for the firm's new Crilicon X-R series of acrylic emulsions for water-base paints and coatings.

•

Distributor Appointed

The Arizona Chemical Co. has named Welch, Holme & Clark Co., Inc., Newark, N. J., as a distributor of "Acintol" tall oil fractions for the New York and metropolitan New Jersey areas.

•

Loyd Heads Sales Office

Inland Steel Container Co., drum and pail manufacturing division of Inland Steel Co., has announced the opening of a Houston, Tex. sales office under James F. Loyd.

The Houston sales office, which will cover the lower Texas area, will be headquartered with the firm's district sales office in the Texas National Bank Building.

•

Fuller Paint in Space

W. P. Fuller & Co. has confirmed the information that Fuller paints are now flying around in space on the Explorer I satellite that was launched at Cape Canaveral, Fla.

The paint, a white lusterless, quick-drying enamel, was used on the rocket engine housing of the satellite.

The enamel was selected by the California Institute of Technology Jet Propulsion Laboratory because of its high resistance to heat and durable quality under rugged conditions, and because a surface with low light absorption was required.

Tamms Moves Plant

E. E. Troyer, president of Tamms Industries Co., has announced that the firm has moved into its new plant on U. S. Highway 66, south of 47th Street in McCook, Ill., a Chicago suburb.

The plant has approximately 40,000 sq. ft. which will be used for manufacturing and warehousing.

The new plant also includes a modern research laboratory.

WATER GROUND

MICA

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HOUSE PAINTS

LATEX-EMULSIONS

FRANKLIN MINERAL PRODUCTS

COMPANY

FRANKLIN, NORTH CAROLINA

CORPORATED 1926

Agents in Principal Cities

DISPLAY AWARD: Joseph Trocki, left, production manager of the Reardon Company's eastern division, receives plaque from Carl Metz, president of the Philadelphia Home Show Assn. The Reardon Co. display of Bondex and Dramex products won second place honors in judging at the Philadelphia show.

Summers Gives Talk

Hugh B. Summers, Jr., chemical engineer, naval stores research station, addressed the meeting of the Peninsular Florida Section of the American Institute of Chemical Engineers held recently in Daytona Beach, Fla.

His paper, entitled "Gum Naval Stores Processing and Products," described the changes that have occurred in the gum naval stores industry due to the development of the "Olustee" process of pine gum cleaning and steam distillation.

Now A New

WATERGROUND MICA

GIVES *Better* MOISTURE RESISTANCE

Tests prove advantages of product containing ½ 1000-mesh very fine particles of mica.

Write for technical information and sample.

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CLASSIFIED ADVERTISEMENTS

Rates: $.20 per word, except those seeking employment, for which rate is $.10 per word. Minimum: ten words. Address all replies to Box Number, c/o Paint and Varnish Production, 855 Avenue of the Americas, New York 1, New York.

POSITION OPEN

Paint chemist with broad experience for laboratory technical service on the application of Neville resins and solvents in the coatings industry. Contact William Ittel for details. Neville Chemical Co., Neville Island, Pittsburgh 25, Pa.

LICENSING

Top Italian chemical firm is interested in obtaining licensing arrangement for producing iron oxide reds, blacks and browns. Write Box 758.

PURCHASING AGENT AVAILABLE

15 years heavy industrial purchasing in process industries. Experienced in developing and administering purchasing and other allied functions such as Traffic, Material Control, Production Control, Warehousing and Material Handling. Box 5581.

CALENDAR OF EVENTS

July 7-11. Organic Coating Conference, Gordon Research Conferences, New Hampton School, New Hampton, N. H.

Oct. 5-9. 36th Annual Meeting and 23rd Paint Industries' Show of Federation of Paint & Varnish Production Clubs, Cleveland Public Auditorium, Cleveland, Ohio.

Oct. 27-29. Seventy-first annual convention of the National Paint, Varnish & Lacquer Assn., Shoreham Hotel, Washington, D. C.

Production Club Meetings

Baltimore, 2nd Friday, Park Plaza Hotel.

Chicago, 1st Monday, Furniture Mart.

C.D.I.C., 2nd Monday.

Cincinnati — Oct., Dec., Mar., May, Hotel Alms.

Dayton — Nov., Feb., April, Suttmilers.

Columbus — Jan., June, Sept., Fort Hayes Hotel.

Cleveland 3rd Friday, Harvey Restaurant.

Dallas, 1st Thursday after 2nd Monday, Melrose Hotel.

Detroit, 4th Tuesday, Rackham Building.

Golden Gate, 3rd Monday, Sabella's Restaurant, San Francisco.

Houston, Monday prior 2nd Tuesday, Ship Ahoy Restaurant.

Kansas City, 2nd Thursday, Pickwick Hotel.

Los Angeles, 2nd Wednesday, Scully's Cafe.

Louisville, 3rd Wednesday, Seelbach Hotel.

Montreal, 1st Wednesday, Queen's Hotel.

New England, 3rd Thursday, University Club, Boston.

New York, 1st Thursday, Brass Rail, 100 Park Ave.

Northwestern, 1st Friday, St. Paul Town and Country Club.

Pacific Northwest, 3rd Thursday, Washington Athletic Club, Seattle, Wash.

Philadelphia, 3rd Wednesday, Philadelphia Rifle Club.

Pittsburgh, 1st Monday, Gateway Plaza, Bldg. 2.

Rocky Mountain, 2nd Wednesday, Republican Club, Denver, Colo.

St. Louis, 3rd Tuesday, Kings-Way Hotel.

Southern, Annual Meetings Only.

Toronto, 3rd Monday, Oak Room, Union Station.

Western New York, 1st Monday, 40-8 Club, Buffalo.

No club meetings: June-August.

NEWS

Programs Scheduled by Paint Division of ACS

The advisory committee of the American Chemical Society, Division of Paint, Plastics & Printing Ink Chemistry, recently met in San Francisco.

The following programs were scheduled:

September 7-12, 1958. Chicago.

L. Reed Brantley. *General Papers.*
Allen L. Alexander. *Mechanism of Anticorrosive Primers.*
Charles Hamilton. *Polymers Based on Weak Acids.*
William Smythe. *Foamed Plastics.*

April, 1959. Boston.

Richard B. Bishop. *Isotactic (Steriospecific) Polymers.*
L. H. Wartman. *Stabilization of Polyolefins.*
Maurice E. Bailey. *Formed-in-Place Coatings (Plastic).*
Allen L. Alexander. *General Papers on Coatings & Plastics.*

September 13-18, 1959. Atlantic City.

Arthur W. Sloan. *Plastics as Solid (Rocket) Fuels.*
George E. Power. *Structural Laminates.*
Sylvan O. Greenlee. *Epoxy Resins & Resinous Polyols for Coatings.*
Allen L. Alexander. *General Papers on Plastics and Coatings.*

•

Hummel Offers Al Powders

The Hummel Chemical Co. of New York is now offering a complete line of aluminum powders and pastes for paint and lacquer applications.

Leafing and non-leafing powders and pastes recommended for producing hammer finishes and polychromatic effects are included in the product line.

•

Name Change

The National Cylinder Gas Co. has changed its name to Chemetron Corp., it has been announced.

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NEWS

Vickers Delivers Benzene

The first benzene claimed to have ever been manufactured in Kansas was delivered by the Vickers Chemicals Division of the Vickers Petroleum Co., Inc., to the Wichita plant of Frontier Chemical Co., a division of Vulcan Materials Co.

The benzene was manufactured at Vickers' new petrochemical plant located in Potwin, Kansas.

Vickers said that along with benzene, salable products manufactured at the Potwin refinery since the June 1 start-up of the Udex extraction unit included toluene, xylene and Solvent V-100.

It was added that V-110 and V-120 are also being manufactured at Potwin.

Annual production of benzene, toluene, xylene and other petroleum aromatics is expected to reach 15 million gallons.

•

S. S. Gutkin Passes

Samuel S. Gutkin, 53, eastern technical sales-service manager for Cargill, Inc., died recently in Plainfield, N. J.

He was first employed as a chemist with American Cyanamid Co. and joined Cargill in 1952.

APR Licensees Meet

A conference of APR licensees was held in Washington, D. C. on May 28 and 29.

Seventeen members of the group manufacturing paints under APR germ-proofing process met in the Hotel Raleigh to discuss merchandising plans and a national advertising campaign as a result of the excellent consumer acceptance of APR paints.

New APR technical developments, recently brought from Europe, were also introduced.

V. A. Dobrohotoff, president of Denton Edwards Co., Ltd., APR licensing firm, was chairman of the meeting.

•

Reichhold Listed on Exchange

Reichhold Chemicals, Inc., manufacturer of synthetic resins and a producer of basic chemicals for industry and color pigments, became one of the newest firms whose shares are listed on the New York Stock Exchange. It takes its ticker symbol from its initials, RCI.

The chemical company owns and operates 14 plants in the U. S. and has interests in or affiliations with 24 others throughout the world which manufactures RCI products.

RCI's net income after taxes for 1957 was well over $3,000,000. Its assets as of the close of 1957 were $18,118,353, an increase of more than $1,000,000 over the preceeding year.

•

Plant Being Built

A new plant is being built at Owensboro, Ky. which will more than double present capacity for vinyl acetate polymers and copolymers and styrene-butadiene copolymer latices, it has been announced by the Dewey & Almy Chemical Co., division of W. R. Grace & Co.

The new plant, together with a battery separator plant at the same site, will cost about $4,000,000.

Construction on a 143-acre tract, bordering the Ohio River, began in May. The plant is expected to begin operations early in 1959.

Because of the unique structure and tremendous surface area of these microscopic diatom particles, Dicalite inert extenders such as high-brightness Dicalite L-5 give easy, positive control of sheen . . . any degree from semi-gloss through eggshell down to dead flat. And Dicalite-flatted paints are flat from *all* angles, not just the 'standard' 60° angle. That means that on long wall or ceiling areas a Dicalite-flatted paint won't glare or shine from any angle of view.

Best of all, in flatting with Dicalite there is no 'critical' point, as there is in flatting by varying the amount of prime pigment, nor is there any adverse effect on leveling and washability. In fact, Dicalite improves the washability, wearability and brushability of a paint—manufacturers' own tests have proved that!

We mentioned high brightness. Dicalite L-5 rates 90 or better on the G.E. scale—lets you replace significant amounts of expensive prime pigment and still retain bright whites and clear, clean colors with excellent hiding power.

There are still more advantages to be had with Dicalite high-brightness inert extenders! Write for information.

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TECHNICAL Bulletins

WET GROUND MICA

Technical Bulletin No. 35 has been made available by the Wet Ground Mica Assn., Inc., Dept. PVP, 420 Lexington Ave., New York 17, N. Y.

The bulletin contains Parts II and III of "Studies of the Influence of Wet Ground Mica on the Water Vapor Permeability of Paint Films."

Part II is concerned with studies on paints with regular pigment/volume concentration. Part III deals with studies on the water vapor resistance of latex paint films.

MARKET RESEARCH

A 14-page catalog on chemical market research consulting has been made available by Roger Williams, Technical & Economic Services, Inc., Dept. PVP, P.O. Box 426, Princeton, N. J.

The history, facilities, methods, typical studies and geography of the firm are outlined in this illustrated booklet.

LABELS

A fully-illustrated catalog and an up-to-date price list has been made available by the Ever Ready Label Corp., Dept. PVP, 10 E. 49th St., New York 17, N. Y.

The catalog outlines the kind of labels that the company manufactures, ranging from continuous rolls to perforated specialties.

Illustrated sections are devoted to various types of labels. These include the "handle with care," "shipping," "carrier protection," "tom thumb," and "air mailers."

INSTANT ANTIFOAMS

A three-page information sheet of the firm's instant antifoams have been made available by Hodag Chemical Corp., Dept. PVP, 7247 N. Central park, Chicago 45, Ill.

The information sheet includes features of the new antifoams, when and how to use them, what quantities to use, and general theory behind their use.

DUPLICATING SUPPLIES

Latest advances in offset duplicating supplies are described in catalog No. 22 offered by Michael Lith, Inc., Dept. PVP, 143 West 45th St., New York 36, N. Y.

Designed for organizations with Multilith, Davidson, A. B. Dick, Whitin, and similar duplicating machines, the 48-page catalog is divided into four illustrated sections: copy preparation aids, platemaking supplies and chemicals, bindery aids, and press accessories.

WETTING AGENTS

A brochure describing the expanded Hyonic PE series of octyl phenol ethylene oxide condensates has been made available by Nopco Chemical Co., Dept. PVP, Harrison, N. J.

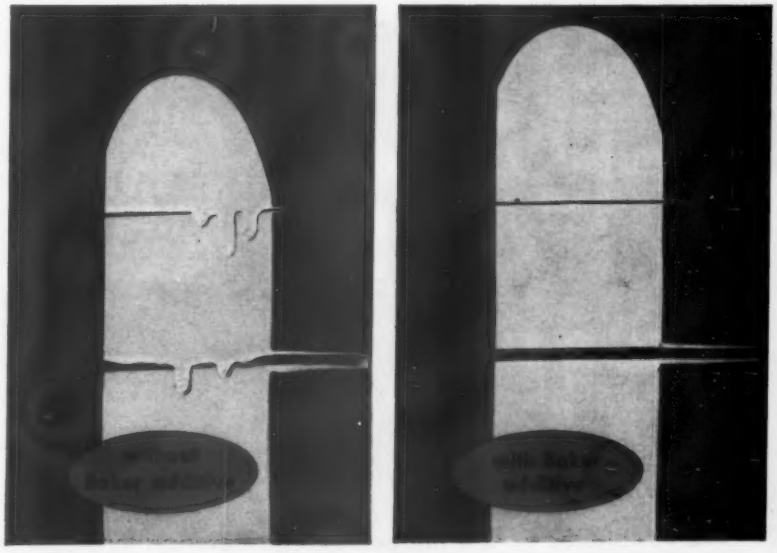
The booklet outlines the eight versatile products included in the series and discusses their wide range of application in the surface-active field.

ACRYLIC PAINTS

"Acrylic Emulsion Paints for Exterior Masronry" is the title of a new 10-page booklet offered by the Rohm & Haas Co., Dept. PVP, Washington Square, Philadelphia 5, Pa.

The booklet is based on lectures prepared by Gerould Allyn for the University of Florida's 1958 short course in paint technology.

Subjects covered include an outline of the development of water-



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thinned paints, acrylic paint formulations, outdoor applications to various types of surfaces, and summaries of fourth and fifth year exposure findings of mildew resistance and color retention.

Also available from the company is a 30-page technical manual outlining the technology of acrylic latex paints for interior use.

Entitled "Acrylic Emulsions for Interior Paints," the manual is based on five years of formulating and manufacturing experience with acrylic paints. It is a companion volume to a recently published "Progress Report Four," an 80-page manual covering the firm's five years of experience with acrylic paints for exterior use.

The manual gives summaries, tables and formulations for each type of interior acrylic paint, including sealers, primer sealers, white top coats, tint bases and colored paints.

Equipment for handling acrylic emulsions in bulk is also discussed.

ISOBUTYL ACETATE

The use of isobutyl acetate in lacquer solvent systems is described in a brochure published by Eastman Chemical Products, Inc., Dept. PVP, 260 Madison Ave., New York 16, N. Y.

Included in this brochure are comparisons of isobutyl acetat with the other principle medium boiling solvents, n-butyl acetate sec-butyl acetate and methyl iso butyl keytone.

These comparisons include th physical properties and the evapor ation rates of these solvents, in dividually and in various blends.

A comprehensive chart compare the effect of each of these solvent upon the solution viscosities o formulations containing 13 dif ferent polymers.

SIDE-LOADING UNIT

The side-loading handling unit the "Traveloader," is featured in an eight-page bulletin published by Baker Industrial Trucks, Division of the Otis Elevator Co., Dept. PVP, Cleveland 2, Ohio.

The bulletin, designated 1360B describes the vehicle in detail and offers complete dimensions, aisle diagrams, controls and other data.

SYNTHETIC WAXES

The 1958 catalog of "Synthetic Waxes" has been published by the Glyco Products Co., Inc., Dept. PVP, Empire State Building, New York 1, N. Y.

Details are given of the properties of the company's synthetic waxes and suggested uses as adhesives, lubricants, anti-block and mold-release agents.

Applications in the paint and plastic industries are also outlined.

HAND LIFT TRUCKS

A circular especially designed to simplify the selection of hand lift trucks has been made available by Lewis-Shepard Products, Inc., Dept. PVP, 125 Walnut St., Watertown 72, Mass.

Designated as Circular 26B, the illustrated brochure enables the buyer to specify the exact hand lift truck for his operation through a selector chart.

Categories included in the chart for each of the 12 basic types of hand lift trucks are lifting height in inches; type of lifting mechanism; whether used with skids, single- or open-faced pallets; operating features; capacities; and platform, fork lengths, and widths available.

Another section gives tips on where and how lift trucks are best utilized in plants and warehouses.

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New Books

Targeting Sales Effort

By Charles W. Smith. Published by the Columbia University Press, Columbia University, New York 27, N. Y. Price $15.00.

The book presents the details of a method that can be used to determine the structure of a company's distribution system through analysis of available sales and market potential information on a trading center by trading center basis.

It provides the reader with market information coded by cities, counties, and trading centers, and it illustrates how the method can be applied to specific problems frequently encountered by sales executives.

Mr. Smith is senior consultant on the staff of McKinsey & Co., Inc., management consultants. He has just finished a term as president of the American Marketing Assn. and is currently serving as a trustee of the Federal Statistics Users' Conference.

A Review of the Air Force Materials Research & Development Program

By H. E. Hines. Published by the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Price $4.75.

Abstracts of technical papers and notes written during the period July 1956 through June 1957 under the Air Force's materials research and development program are contained in the publication just released.

Nearly 300 reports appearing during the 12-month period are abstracted. They cover a wide range of subjects, including research in adhesives, plastics and protective coatings.

Reports available to industry from the OTS are so designated in the publication. In addition, a contractor index, investigator index, and a numerical index of all technical reports issued during the period March 1923 through June 1957 are included.

•

Acrylic Lacquers Offered

The Sherwin-Williams Co. has announced that it is now introducing a complete line of acrylic lacquers to the automotive refinishing trade.

The company's program is geared to give refinishers the same infinite range of tints and shades they have long enjoyed in the nitrocellulose field.

Federation & Association To Meet Jointly

The 1958 conventions of the Federation of Paint & Varnish Production Clubs and the National Paint, Varnish & Lacquer Assn. will be held at Atlantic City, N. J., October 19 through October 24, 1959.

The National Paint, Varnish & Lacquer Assn. will meet Monday, Tuesday and Wednesday, Oct. 19-20-21, 1959, with headquarters at the Chalfonte-Haddon Hall Hotels. The Federation will convene Thursday, Friday and Saturday, October 22-23-24, 1959, with headquarters at the Ambassador and Ritz-Carlton Hotels.

This was announced jointly to the members of both organizations by Dr. Joseph W. Tomecko, president of the Federation, and General Joseph F. Battley, president of the Association.

Joint annual meetings in the years following 1959 are now being formulated by a Joint Convention Committee composed of R. W. Matlack, C. J. Overmyer and C. H. Flynn, representing the Federation; and W. E. Hood, B. Mautz and D. H. Moran, of the Association.

•

Representative Appointed

The Neville Chemical Co. of Pittsburgh has announced the appointment of O'Connor Chemicals, Inc. as its representatives to the coatings, adhesives, paper and related industries in the Detroit area.

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CYZAC Coating Resins are mutually miscible in all proportions, may be blended to combine desirable properties. At 300°F, cure takes 15 minutes or less. Outstanding enamel stability, initial gloss and gloss retention. Complete technical data on request.

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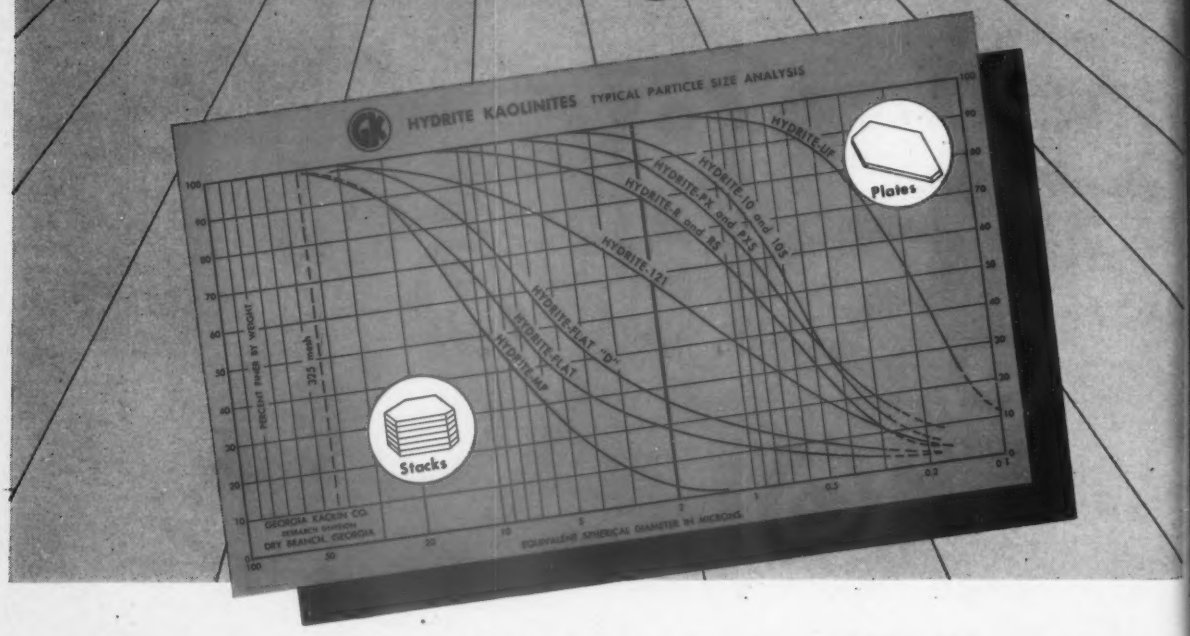

Georgia Kaolin Company announces the introduction of HYDRITE-MP and HYDRITE-UF to its family of HYDRITE KAOLINITE Pigment Extender Clays. This substantially widens the range of particle size distribution from HYDRITE-MP with average particle diameter of 9.5 microns to HYDRITE-UF with average particle diameter of 0.20 micron.

A total of eleven grades of HYDRITE KAOLINITES are now available, offering the formulator greater possibilities for controlling viscosity, dry hide, gloss, brightness and other properties affected by particle size, than can be obtained from any other group of pigment extenders.

For the convenience of the formulator, also, Georgia Kaolin has changed the designations of several of its HYDRITE KAOLINITES. Thus, HYDRITE-PD-10 and HYDRITE-PD-121 become HYDRITE-10 and HYDRITE-121, respectively. HYDRITE becomes HYDRITE-R. When furnished in the predispersed form, HYDRITE-R, HYDRITE-PX and HYDRITE-10 become HYDRITE-RS, HYDRITE-PXS and HYDRITE-10S, respectively.

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